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PROVISIONAL INTELLIGENCE REPORT

ELECTRIC POWER IN CHINA PROPER

CIA/RR PR-86
10 November 1954

CENTRAL INTELLIGENCE AGENCY

OFFICE OF RESEARCH AND REPORTS

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PROVISIONAL INTELLIGENCE REPORT

ELECTRIC POWER IN CHINA PROPER

CIA/RR PR-86

(ORR Project 27.202)

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FOREWORD

This report is the second of two studies of the electric power industry in Communist China. CIA/RR PR-39, The Electric Power Industry in Manchuria, 27 November 1953, SECRET, was concerned primarily with that area of Communist China north of the Great Wall, historically known as Manchuria. The present report covers the area south of the Great Wall. The term China proper is used as a convenient and clarifying designation for that area.

This report presents accurate information about present capacity of electric power facilities in China proper and firmly based estimates of possible expansion. Estimates of total production of electric power, however, are subject to some margin of error, and the production data given should be used with considerable care.

Although detailed research for this report was concluded on 15 April 1954, data which have become available between that time and the completion of writing have been considered and used when applicable.

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ELECTRIC POWER IN CHINA PROPER*

Summary

The industrial development of Communist China is dependent upon the development of the electric power industry. Under existing technology, electricity is the only economically feasible source of power for industry in Communist China.

In 1953 the installed electric generating capacity of that area of Communist China designated as China proper** was 1.3 million kilowatts (kw), about equal to that of the State of Arizona. The population of China proper is about 500 times greater than the population of Arizona. The per capita use of electricity in China proper in 1953 was about one-seventh of the per capita use of electricity in the US in 1902.

Although the electric power industry in China proper is relatively undeveloped, the potential -- in terms of resources -- is great. Coal reserves in China proper are estimated at 262 billion metric tons. *** About 25 million tons were mined in 1953, and only 4.4 million tons were used in the electric power industry. The Chinese Communists claim to have a hydroelectric potential second in the world only to that of the USSR, and they declare that there is a year-round potential of 70 million kw. This annual potential alone is 50 times greater than the total capacity of all electric plants now existing in China proper.

About one-fourth of the total electric power generating capacity of China proper is located in Shanghai (Shang-hai). Because of comparative costs, almost all of the facilities in China proper are steam powered, and more than one-third of the total capacity is in plants of less than 10,000-kw capacity. These small plants were

* The estimates and conclusions contained in this report represent the best judgment of the responsible analyst as of 23 September 1954.
** See the map, China: Electric Power Stations, inside back cover.
*** Throughout this report tonnages are given in metric tons.

comparatively more costly to build, and they are considerably more costly to operate. Only one significant transmission line exists in China proper. It connects Peiping (Pei-p'ing), Tientsin (T'ien-ching), and Tang-shan.

The governmental apparatus which controls the electric power facilities in Communist China is the Electric Power Industry Bureau, subordinate to the Ministry of Fuel Industry, which is one of the six top-level industrial ministries.

Available data do not permit the determination of a definite consumption pattern for electric power in China proper. Because production facilities are largely localized, allocations are controlled by local situations. Some indication of the practice, however, is given by the use pattern in Shanghai, where 80 percent of the available power is used by industry, 15 percent by residential and commercial consumers, and 5 percent by utilities and public transportation.

The labor force of the electric power industry is an insignificant fraction of the total available labor force in China proper. The requirement for technical supervision in the industry, however, is a major problem. The Communist government considers most of the technicians who worked in the industry prior to 1949 to be politically unreliable, but does not have suitable replacements for them. The USSR is furnishing the technical help needed in many of the new installations. The shortage of technically trained personnel for the operation of existing facilities, while in no way crippling, does reduce the present efficiency of operation. The large-scale technical education effort of the government should, by the end of the 1950's, do much to alleviate this condition.

At present the Chinese have extremely limited facilities for the manufacture of large electrical equipment and parts required for the industry. Although expansion of manufacturing facilities is now in process and, within the next decade, should permit the manufacture of a nominal amount of medium-size equipment, the larger equipment and parts will probably still be available only as imports.

The principal source of new equipment has been the USSR. An agreement of February 1950 covered the supply of capital equipment, to be paid for by the Chinese with foodstuffs, textiles, and nonferrous metals. This agreement has been reviewed each year, new

protocols being signed to cover the exchange of materials in the current year. The only publicly announced protocol which covered a specific category of facility was the one in February 1953 on repair and expansion of power plants. In September 1953 a new all-inclusive agreement was announced, covering 141 various industrial projects, including all those started since 1949 and those planned before 1959, for which the USSR was to furnish design, equipment, and technical supervision of both erection and initial operation. About 24 power plants were included among the 141 projects. In the location of these new facilities, the major emphasis is on Northeast China, where most of the projects being furnished by the USSR will be located. Among the areas of China proper, only North China is scheduled to receive any significant number of new electric facilities. This is to be expected as the Chinese attempt to follow Communist theory and develop heavy industry first; it also coincides with the location pattern favored by the USSR.

It is estimated that output of electric power in 1957 will be 5.6 billion kilowatt-hours (kwh), as compared with an output in 1953 of 4.1 billion kwh -- an annual rate of increase of about 8 percent.

The vulnerability of the electric power industry in China proper lies in its geographical concentration in a few industrial centers in the east and in its dependence upon imports for heavy machinery and equipment for the production of electric power.

It is unlikely that the electric power industry in China proper will be a significant factor in revealing military intentions. Virtually any steps taken to increase production facilities could be interpreted as an effort to provide adequate electric power for industry in a peacetime economy.

I. Introduction.

A. General.

In the existing state of industrial technology, electricity is the only economically feasible source of power for industry in Communist China. Although the cost of electric power is a minor fraction of total production costs, electric power is indispensable to most industries. The amount of electric power available limits the number of production facilities which may be operated, and when new facilities are completed, electric power must be available before they can be used. The amount of electric power consumed is an indication of the general level of industrial output. Thus, a study of the electric power available and the amount used in Communist China is a valuable indication of the relative success of the Chinese Communists in their efforts to increase their industrial output.

This report is concerned with that area of Communist China which is south of the Great Wall.* That area, referred to in this report as China proper, consists of North China, East China, Central and South China, Southwest China, and Northwest China as established by the present (1954) administrative and political organization. The almost negligible electric power facilities of Suiyuan (Sui-yuan) Province, which was transferred from North China to the Inner Mongolia Autonomous Region early in 1954, are included with those of North China. Chahar (Ch'a-ha-erh) Province, similarly transferred from North China to Inner Mongolia, has no significant electric power facilities, and Tibet has only one small power plant. Both areas, therefore, are excluded.

The electric power industries of Northeast China and the Inner Mongolia Autonomous Region (excluding Suiyan and Chahar Provinces), which account for about half of the total electric power generating capacity of Communist China, have been analyzed in another report.** For purposes of reference, the term Manchuria -- historical name for the Chinese territory north of the Great Wall -- is used in this report to designate the Northeast China Area and the Inner Mongolia Autonomous Region as they existed before 1949.

* See the map, China: Electric Power Stations, inside back cover.
** See CIA/RR PR-39, The Electric Power Industry in Manchuria, 27 November 1953. SECRET.

The electric power industry in China proper is statistically insignificant. The total installed capacity in 1953 was about equal to that of the State of Arizona; in China proper there are more than 500 people for every person in Arizona. The capacity was about one-twentieth that of the USSR and about one-eightieth that of the US. The contribution of the electric power industry to the 1953 Gross National Product in China proper was estimated at one two-hundred-twentieth part of the total.

When the Chinese Communist government gained control of China proper, there was a small base of modern industry, established only about 50 years ago by foreign powers -- mostly in and near the Treaty Ports. Faced with a rapidly expanding population supported by a subsistence-level agricultural economy, the government concluded that only through the expansion of modern industry could an economic advance be made. That government is, therefore, trying to accumulate the capital required for new industrial facilities.

B. History.

By 1936, there were in China proper 460 public utility plants totaling approximately 635,000 kw and 158 industrial power plants totaling approximately 242,000 kw. About one-half of the power-operated industry was located in Shanghai and considerably more than half in the Shanghai-Nanking (Nan-ching)-Hanchow (Hang-chou) triangle. 1/*

Japan invaded China in July 1937, quickly occupying the entire coastal region, which contained almost all of the electric power facilities. The Nationalists, crowded back into the southwest area of the country, applied their best efforts to an attempt to provide electric power facilities for the arsenals and other industrial activities which they established. As a result of their activities, by 1945 they had a total installed capacity of 53,142 kw in the area under their control. 2/

The Japanese were not concerned with the general industrial development of China south of the Great Wall. Rather they were concerned only with the facilities producing exportable commodities

* Footnote references in arabic numerals are to sources listed in Appendix D.

not in competition with those of Japan. Thus, in the period of their control the power plants in North China which served the coal mines were expanded, and the power facilities in Shanghai, which served primarily the cotton mills, were never fully utilized.

C. Organization.

1. General.

The general economy of the country during the period of Nationalist control from 1946 to 1949 was generally disjointed, the Nationalists controlling the major centers of population and the Communists interfering with transportation among these areas at will. The capacity and output figures published by the National Resources Commission (NRC) for this period never reflected the total capacity in the area, therefore, nor did they represent a reasonable output from the controlled fraction of capacity, such as might be expected under peaceful conditions. By the beginning of 1951 the Chinese Communist government was established throughout the area of China proper, and Chinese Communist government organizations had replaced the Nationalist organizations in the control of mainland power plants.

With the defeat of the Japanese in 1945 the Chinese Nationalist government returned the electric utilities to the groups which had controlled them before the Japanese seizure, with the exception of those properties which resulted from Japanese investment and certain other foreign properties, which were retained under the control of the NRC. Thus when the Chinese Communists gradually assumed control of the area during 1949-50, the electric power facilities were in diverse hands. In general, equivalent Chinese Communist governmental organizations replaced those of the Nationalists without appreciably changing the pattern of control.

The Chinese Communist central government organ concerned with electric power is the Ministry of Fuel Industry,* one of six industrial ministries. Within this ministry is the Electric Power Industry Bureau under Director Pao Kuo-pao. Other bureaus in the Fuel Ministry control the coal and petroleum industries.

* The Minister is Ch'en Yu. Liu Lan-po, Vice Minister, gave the report of the Ministry to the Government Administration Council (GAC) on 7 January 1954. The other Vice Ministers, as of August 1953, were: Li Fan-yi, Li Jen-chun, Hsu Ta-pen, and Wu Te. 3/

The Hydroelectric Construction Bureau of the Ministry of Fuel Industry is under Director Li Jui. Its functions include the large-scale construction of hydroelectric plants, the control and utilization of water resources, the problem of the over-all operation of surveying work, and the general supervision of various subordinate hydroelectric organizations. 4/ It appears that as of 1954 the major activity of this bureau has been the collection of hydroelectric survey data.

In January 1954 it was announced that along with a number of other ministries the Ministry of Fuel Industry had organized its own special construction force. 5/ In January 1953 the Ministry had established a Design Bureau to draft designs for construction of electric power plants under the Electric Power Industry Bureau. 6/

Information is not at all definite as to the line of control down to various individual power plants. It would appear from press releases that those plants resulting originally from municipal and provincial investment are still controlled by the governments at these levels. The various foreign plants were earlier expropriated under the guise of military necessity and placed under military control commissions. During the several years of Communist control it appears that more and more of the electric utility facilities have been placed under the direct supervision of the Ministry of Fuel Industry in Peiping, with the subordinate governments exercising less supervision than formerly. The following news release, in February 1953, is interesting as a case in point: "To enhance the unified leadership of the public and private power factories of Shanghai, the Shanghai People's Government has, in compliance with the instructions of the Central Ministry of Fuel Industry, amalgamated the local power administration and the head office of the Military-controlled Shanghai Power Company to form the Shanghai Electrical Industry Administration Bureau." 7/

Those power plants which are operated primarily as a portion of other industrial facilities probably come under the control of the ministry responsible for the main industry. It appears, however, that the Ministry of Fuel Industry exercises technical supervision and requires reports from such plants.

With the expropriation of the French Power Company in Shanghai in November 1953, it would appear that almost all public utility plants in China proper are now under direct control of government agencies.

Some fraction of the power plants in other industrial installations, however, is presumed to be still considered as private industry. Regardless of nominal title to the facilities, there is little question that the Central People's Government of Communist China (CPG) exercises effective control over the operation of all electric power plants in China proper and allocates the available power in connection with its other economic plans. It may further be presumed that it is the ultimate intention to centralize control of all major power facilities under the Peiping government.

2. Planning.

One unique problem confronts those who operate a centrally planned economy, the mechanism of planning itself. The First Five Year Plan of China (1953-57) was not inaugurated until 1953. For the Chinese Communists, then, the first problem was to establish a base of statistical data from which they could accurately evaluate present performance. For this purpose the State Statistical Bureau was established late in 1952 and issued its first public report on 28 September. The government is still not satisfied with its statistical reporting methods. Witness the 5 September 1953 directive of the Government Administrative Council relative to reporting methods; the revised provisional regulations on reporting forms issued by the Central People's Government State Statistics Bureau, 6 September 1953; and the official editorial criticism of chaos in investigative and statistical work. 8/ In connection with this same activity, the issuance in July 1953 by the Southwest Statistical Bureau of "Certain Provisions Concerning the Unified Use of Statistical Figures" severely limited even the internal dissemination of statistical data without approval and coordination by the area bureau. 9/ The second All-China Conference on Statistical Work was held by the National Statistics Bureau of the Central People's Government at Peiping from 16 February to 5 March 1954. The reports of the conference and the accompanying editorials once again emphasized that the level of current achievement was not satisfactory and that further work was needed. It is of interest that among these comments was the statement that it was not currently possible to attempt complete reporting of enterprises in which the state had no financial interest, and that these enterprises should be reported by sample-investigation methods. 10/

Several releases late in 1953 are valuable as indications of the level of advance planning generally achieved. 11/ The 1954 plans of individual enterprises were due for submission to higher

authorities in December 1953. It was indicated that these plans were to be in two parts, an annual plan and a first-quarter plan. The individual enterprises were to proceed on the basis of their first-quarter plans as soon as they were approved by their immediate supervising authority, since it was hoped that the resulting national plans, when finally established, would not represent too great a change. Thus it would appear that a centrally ordained and detailed plan has not been attempted, but central justification and reconciliation of locally established plans has been accomplished. Further, the national plan will not be established until well into 1954 and will still be subject to revision. With the 1954 plans thus still in question, it is extremely doubtful that the Five Year Plan goals have been established in other than the most general and tentative terms.

II. Resources.

A. Coal.

Coal is considered to be the most valuable natural resource of China. A major part of the electric energy used in China is derived from coal. An estimate of the total coal reserves in China proper places them at 262 billion tons. 12/ The total amount of coal mined in China proper in 1953 is estimated at about 25 million tons. Certainly the availability of fuel reserves will not limit any expansion of thermal electric power plants. The bulk of coal reserves is concentrated in North China and Northwest China, but small deposits are found in the other areas. The major mining efforts have thus far been in North China, although small mines are scattered quite generally throughout China proper. Reference to the attached map will show this distribution of reserves and the location of mines.*

B. Hydroelectric.

During the current century, a large number of surveys of the power potentially available from the rivers of China proper have been made. One Chinese Communist estimate was as follows 13/:

Area	Potential Power Resources (Million Kilowatts)
Southwest China	97.2
Central and South China	18.5
Northwest China	17.4
East China	4.8
North China	4.8
Total	142.7

This estimate has been identified elsewhere 14/ as the potential available for half the year, but the potential available for 95 percent of the year, as limited by the seasonal variation in stream flow, was estimated at only about half of the above total. Other estimates vary widely, but even the lowest indicates a potential many times the 1953 total of 1.3 million kw, composed of 1.5 percent hydroelectric and 98.5 percent thermal electric capacity.

The Chinese Communist government early recognized the significance of this potential in its economic planning. Since the existing economy is primarily agricultural, however, the main efforts have thus far been directed at control of the rivers to prevent floods, which have devastated large areas almost every year, and at providing at least a minimum flow during the rest of the year to provide water for irrigation. Thus far any hydroelectric plant construction in China proper has been primarily ancillary to the river control efforts.

The Ministry of Water Conservancy, one of the top-level government ministries,* has primary responsiblity for this river control work. A late 1953 summary 16/ of the work of this ministry included the following: All major rivers, the Yellow (Huang Ho), Yangtze (Ch'ang Chiang), Hwai (Huai Ho), Yungting (Yung-ting Ho), and the Pearl (Chu Chiang) had their dykes overhauled and strengthened. On the Hwai River the San-ho movable dam was completed. On the Yungting River the 45-meter-high Kuan-ting dam was completed. Irrigation was the major purpose of water conservancy; an area roughly the size of Belgium was brought under irrigation. Dredging work and locks were reported

* Ministry of Water Conservancy: Minister, Fu Tso-yi; Vice Ministers, Liu Pao-hua (Chao Chen-sheng), Chang Han-ying, and Ch'ien Cheng-ying. 15/

to have greatly increased the usefulness of the waterways for the transportation of goods. Finally, the summary noted that since the hydroelectric power reserve of China was very important, surveying work was being pushed intensively. An analysis of other reports confirms the foregoing pattern of emphasis. The flood control and irrigation work, insofar as they minimize the annual variation of flow on the major rivers, will be of value to future hydroelectric developments. The only indication of intentions is that major hydroelectric developments will not be included in the First Five Year Plan, but will be postponed for the indefinite future.

The Chinese Communists, in their plans for major hydroelectric projects, must make allowance for the especially heavy silt burden in their major rivers as they flow through populous areas where electric power is required. The populous areas have been so long denuded of natural vegetation that the runoff carries a burden of silt unique in the world. In certain areas, irrigation dams fill to their crests with sediment in a single season. It may be partly in recognition of this problem that the Chinese have devoted major efforts to reforestation and other techniques intended to control the silt burden of their rivers well in advance of any major hydroelectric projects.

III. Facilities.

A. Production.

1. Geographical Distribution.

The concentration of electric power facilities in Shanghai and the other Treaty Ports where foreign nationals formerly had extraterritorial rights is striking. About 25 percent of the electric power generating capacity in China proper is located in Shanghai alone, over 8 percent in Tientsin, over 5 percent in Tsingtao (Ch'ing-tao), and over 4 percent in Canton (Kuang-chou) (see Appendix A). When six of the smaller Treaty Ports are included with these major ports, the total accounts for about one-half of the entire capacity of China proper.

The accompanying map* shows the concentration of electric power facilities in the eastern portion of China proper. The total

* Inside back cover.

in this eastern section, including the North China, East China, and Central and South China areas, is 92 percent of the total for China proper.

This pattern of concentration has resulted from the foreign investment in areas close to the seaports and is not likely to suffer drastic change in the next decade. Efficiency of operation of electric power facilities increases with size. The Chinese Communists at first talked considerably about dispersing the Shanghai industries through the rest of the country, but little was done about it, very probably because electric power was not available elsewhere for the industries. The Chinese are locating some new facilities in the Northwest, but in the interest of getting immediate maximum utilization from new equipment, much of what is available is going into the existing industrial centers where electric power facilities cannot meet existing demand.

Table 1* shows the distribution of electric power facilities in China proper.

2. Technology.

The technology involved in electric power facilities is, in general, common knowledge throughout the world. The Chinese Communists are limited, however, by the obsolete and obsolescent character of most of their electric power facilities, in taking full advantage of current technology. The fact that almost all the facilities in the area are over 10 years old and that half are over 20 years old means that their operation cannot approach the efficiency of new equipment.

Frequent mention has been made of the fact that Soviet practice is being followed in a new plant under erection in 1954 at T'ai-yuan, which is to be a combined heat and power station. Indications are that several other new plants will be of this type. The intent is to generate at a central power plant most of the steam required for heating and process uses in the area, generating the steam at relatively high pressures and using it to operate a steam turbine to generate electric power before it is used for heating and other purposes. This kind of installation presents a number of problems in the design and installation of the steam distribution system. These problems have led US utilities to look without special

* Table 1 follows on p. 13.

Table 1

Distribution of Electric Power Plants in China Proper a/*
1953

Kilowatts

Area and Province	Public Utility Plants				Captive Industrial Plants b/				Total				Percent of Total
	Steam	Hydro-electric	Diesel	Total	Steam	Hydro-electric	Diesel	Total	Steam	Hydro-electric	Diesel	Total	
North													
Hopeh	185,509	0	0	185,509	112,040	0	0	112,040	297,549	0	0	297,549	22.9
Shansi	66,450	0	0	66,450	1,150	0	0	1,150	67,600	0	0	67,600	5.2
Chahar	0	0	0	0	0	0	0	0	0	0	0	0	0
Suiyuan	6,550	0	0	6,550	0	0	0	0	6,550	0	0	6,550	.5
Total	258,509	0	0	258,509	113,190	0	0	113,190	371,699	0	0	371,699	28.6
East													
Anhwei	15,260	0	0	15,260	0	0	0	0	15,260	0	0	15,260	1.2
Chekiang	29,366	0	0	29,366	0	0	0	0	29,366	0	0	29,366	2.2
Fukien	13,800	0	0	13,800	0	0	0	0	13,800	0	0	13,800	1.1
Kiangsu	350,936	0	18,000	368,936	44,895	0	0	44,895	395,831	0	18,000	413,831	31.8
Shantung	76,800	0	0	76,800	50,590	0	0	50,590	127,390	0	0	127,390	9.8
Total	486,162	0	18,000	504,162	95,485	0	0	95,485	581,647	0	18,000	599,647	46.1
Central and South													
Honan	21,000	0	0	21,000	7,700	0	0	7,700	28,700	0	0	28,700	2.2
Hunan	23,000	0	0	23,000	2,750	0	0	2,750	25,750	0	0	25,750	1.9
Hupeh	55,250	0	0	55,250	7,000	0	0	7,000	62,250	0	0	62,250	4.8
Kiangsi	9,424	0	1,750	11,174	3,750	0	0	3,750	13,174	0	1,750	14,924	1.1
Kwangsi	5,160	0	1,540	6,700	3,200	0	0	3,200	8,360	0	1,540	9,900	.9
Kwangtung	67,500	5,600	4,030	77,130	3,650	0	0	3,650	71,150	5,600	4,030	80,780	6.2
Total	181,334	5,600	7,320	194,254	28,050	0	0	28,050	209,384	5,600	7,320	222,304	17.1

* Footnotes for Table 1 follow on p. 14.

Table 1

Distribution of Electric Power Plants in China Proper a/
1953
(Continued)

Kilowatts

Area and Province	Public Utility Plants				Captive Industrial Plants b/				Total				Percent of Total
	Steam	Hydro-electric	Diesel	Total	Steam	Hydro-electric	Diesel	Total	Steam	Hydro-electric	Diesel	Total	
Southwest													
Kweichow	2,000	1,500	0	3,500	0	0	0	0	2,000	1,500	0	3,500	.3
Sikang	0	0	0	0	0	0	0	0	0	0	0	0	0
Szechwan	28,340	6,706	0	35,046	23,330	0	0	23,330	51,670	6,706	0	58,376	4.5
Yunnan	7,480	3,960	0	11,440	4,020	1,440	0	5,460	11,500	5,400	0	16,900	1.3
Total	37,820	12,166	0	49,986	27,350	1,440	0	28,790	65,170	13,606	0	78,776	6.1
Northwest													
Kansu	1,974	0	0	1,974	0	0	0	0	1,974	0	0	1,974	.2
Ningsia	0	0	0	0	0	0	0	0	0	0	0	0	0
Shensi	8,275	0	0	8,275	10,500	0	0	10,500	18,775	0	0	18,775	1.4
Sinkiang	6,225	0	0	6,225	0	0	0	0	6,225	0	0	6,225	.5
Tsinghai	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	16,474	0	0	16,474	10,500	0	0	10,500	26,974	0	0	26,974	2.1
Grand Total	980,299	17,766	25,320	1,023,385	274,575	1,440	0	276,015	1,254,874	19,206	25,320	1,299,400	100.0
Percentage of Total	75.4	1.4	2.0	78.8	21.1	0.1		21.2	96.6	1.5	2.0	100.0	

a. Including only power plants of more than 1,000-kw capacity, as given in Appendix A.
b. These electric power plants were erected and operated primarily as a portion of other types of manufacturing facilities.

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favor on such an arrangement. Quite a number of these stations, called TETs (Russian abbreviation for Heat and Power Station), are, however, in successful operation in the USSR, and they do offer opportunities for thermal economies not present in other arrangements.

3. Type of Plants.

Steam-powered electric plants predominate in China proper, accounting for over 96 percent of the total capacity. The two other commonly used types of plants, internal combustion and waterpower, account for about 2 and 1-1/2 percent, respectively.

The internal combustion power plant requires a smaller initial investment than the other types of plants, but its fuel requirement is a refined petroleum product, which has had to be imported. Maintenance expenses are also higher than for either of the other types. The single plant of the traction company in Shanghai accounts for most of the total capacity of these plants, and it is unlikely that other major plants of this type will be installed.

Although in a waterpower plant the equipment costs are roughly comparable to those of a steam plant, the cost of hydraulic structures, dams, settling basins, penstocks, and associated facilities results in a considerably higher initial investment than for either of the other types. Furthermore, a much longer period of time is required for construction, from 5 to 10 years, because capital has always been scarce and very expensive in China, only a few small hydroelectric plants have thus far been erected.

Since coal supplies have usually been adequate, steam plants have usually been preferred; and although some hydroelectric plants will be erected, steam plants will probably predominate for many years.

4. Size of Plants.

Table 2* indicates the somewhat unusual distribution of power plants by size in China proper. The single 229,000-kw plant in Shanghai is large by almost any standard, and it may be unique in the number of small units (18) combined to achieve this total capacity.

* Table 2 follows on p. 16.

Table 2

Size Range of Electric Power Plants in China Proper
1953

Size Range (Kilowatts)	Public Utility Plants			Captive Industrial Plants			Total		
	Number of Plants	Total Capacity (Kilowatts)	Percent of Total Capacity	Number of Plants	Total Capacity (Kilowatts)	Percent of Total Capacity	Number of Plants	Total Capacity (Kilowatts)	Percent of Totals
1,000 to 1,999	20	26,600	2.1	23	29,480	2.3	43	56,080	4.4
2,000 to 4,999	45	123,265	9.5	45	139,515	10.7	90	262,780	20.2
5,000 to 9,999	15	103,220	7.9	8	52,350	4.0	23	155,570	11.9
10,000 to 14,999	6	79,800	5.5	2	25,670	2.0	8	96,470	7.5
15,000 to 24,999	11	192,600	14.8	0	0	0	11	192,600	14.8
25,000 to 49,999	7	222,900	17.2	1	29,000	2.2	8	251,900	19.4
55,000	1	55,000	4.2	0	0	0	1	55,000	4.2
229,000	1	229,000	17.6	0	0	0	1	229,000	17.6
Total	106	1,032,385	78.8	79	276,015	21.2	185	1,299,400	100.0

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The 28 plants from 10,000 to 55,000 kw, which include 46 percent of the total capacity in China proper are of sufficient size to permit economical operation. In 1953, 36.5 percent of the capacity of China proper was in plants from 1,000 to 9,999 kw. This initial investment, the operational personnel requirements per kilowatt, and the fuel requirements per kilowatt-hour are appreciably higher for such small plants than for larger plants; in all respects, therefore, power from these plants costs more than power from larger plants. It is unusual to find so many small power plants in large cities where there is a public utility supply. This may be explained in part by the fact that power was usually in short and irregular supply during the last half century, and anyone erecting a new manufacturing facility found himself obliged to arrange his own electric supply. The continuing shortage of power has required the continued operation of these small plants.

The total capacity of power plants larger than 1,000 kw in China proper in 1953 has been estimated at about 1,230,000 kw. To place this total in some perspective it may be compared with the 1953 capacity (690,000 kw) of the utility serving Washington, D.C. The capacity of Washington is thus slightly more than half as great as that of the whole of China proper.

B. Transmission Lines.

There is in China proper only one major power interconnection between cities, the 77-kilovolt (kv) line from Peiping to Tientsin and thence to Tang-shan, a distance of about 167 miles.* This interconnection has lent considerable flexibility to the operation of the power plants in the three locations it connects. The utility power plants and many of the industrial power plants in the other industrial

* This 77-kv transmission line extends from the Shih-ching Shan Plant west of Peiping 23 kilometers (km) to the Nan-yuan Substation several miles south of Peiping, thence 115 km to the Number 1 Plant in Tientsin, thence 39 km to the Ta-ku Substation, and thence 92 km along the railroad by way of the Han-ku Substation to the Tang-shan Plant. 17/ A recent report on the supply of 110-kv, 13,500-kilovolt-amperes (kva) transformers to the North China Electric Enterprise Bureau indicates that it is intended to convert this line from 77 kv, which is an unusual operating voltage, to 110 kv, which is the Soviet standard. 18/ Conversion to this higher voltage would permit this line to transmit an appreciably larger block of power.

centers are usually connected to the distribution system, and on occasion lines extend out to other plants in the immediate area.* No other long-distance high-tension transmission lines are known to exist in the area, however, or to be included in current plans.

C. Lack of Standardization.

The fact that much nonstandard equipment exists among the present facilities makes the efficient operation of those facilities more difficult and complicates the problem of maintenance. The most critical part of this problem is the differences in the frequency characteristic -- not only of the generating equipment but also of the using equipment. Although the Chinese government as far back as the early 1930's established 50-cycle alternating current (AC) as the standard for the country, the scarcity of equipment led to the continued use of the 60- and 25-cycle equipment available as well as the direct current (DC) equipment.** According to the plant list in Appendix A, about 128,000 kw, or about 10 percent of the total capacity of the generating equipment now in use, is 60-cycle; 48,000-kw or over 3.5 percent is 25-cycle; and a very small amount is DC. The problem of different frequencies is further complicated, for in most cases the nonstandard frequencies exist in the same localities with others -- often in the same plant. The USSR long ago standardized on 50 cycles, and it is safe to presume that all equipment furnished to Communist China by the Soviet Bloc is 50-cycle equipment. China must eventually either scrap the 60-cycle, 25-cycle, and DC equipment, replacing it with 50-cycle, or continue to operate duplicate distribution systems which may not be interconnected in many localities and also arrange for a continuing supply of nonstandard equipment, an uneconomic alternative.

The multiplicity of different distribution and transmission voltages in use in China proper is another problem, although not nearly as critical. Special transformers which are not excessively expensive may be built to interconnect any voltages. The changing in 1954 of the Peiping-Tientsin-Tang-shan transmission line from 77 kv to the Soviet standard of 110 kv is one evidence of current efforts to eliminate nonstandard equipment.

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* The available information on these connections is included in Appendix A.

** In general terms, generating and using equipment designed for a given frequency will not satisfactorily operate on any other frequency, and systems of different frequencies cannot interchange power.

IV. Capacity and Output.

Table 3 represents estimates of capacity and output in China proper, 1951-57. It should be noted that the total increase in capacity during the years in question is about 400,000 kw. When this is compared with the 1953 Soviet Bloc output of this type of equipment, which has been estimated at 5,500,000 kw,* it is evident that about 1.5 percent of the total annual Bloc output would be sufficient to fulfill this program. It is further evident that the diversion of a fractional part of a percent of the total Bloc output from or to Communist China would radically alter the future capacity.

Table 3

Estimated Capacity and Output of Electric Power Plants in China Proper a/**
1951-57

Year	Capacity (Million Kilowatts)	Production (Billion Kilowatt-Hours)
1951	1.29 (-10 Percent to +10 Percent) b/	3.7 (-40 Percent to +30 Percent) b/
1952	1.30 (-10 Percent to +10 Percent) b/	4.0 (-35 Percent to +35 Percent) b/
1953	1.33 (-10 Percent to +10 Percent) b/	4.1 (-25 Percent to +40 Percent) b/
1954	1.38 (-10 Percent to +15 Percent) b/	4.4 (-30 Percent to +50 Percent) b/
1955	1.45 (-15 Percent to +20 Percent) b/	4.7 (-35 Percent to +60 Percent) b/
1956	1.55 (-15 Percent to +30 Percent) b/	5.1 (-40 Percent to +80 Percent) b/
1957	1.67 (-20 Percent to +40 Percent) b/	5.6 (-45 Percent to +100 Percent) b/

* As of April 1954.
** Footnotes for Table 3 follow on p. 20.

Table 3

Estimated Capacity and Output of Electric Power Plants
in China Proper a/
1951-57
(Continued)

a. This table appears in detailed form as Table 4 in Appendix B. The methodology used in its derivation appears in detail.
b. Possible margin of error.

The utilization factor used in estimated 1954 and subsequent yearly output was from 3.2 to 3.5 thousand kwh per installed kw. This factor is low in comparison with many other areas but is considered to be quite reasonable for China proper in view of the number of small plants, not interconnected, which contributed to the total capacity.

The estimate annual increase in output during the years 1953-57 averages over 8 percent, a rate believed to be possible of achievement, particularly in view of the small base involved.

V. Consumption.

A. General.

Consumption is measured in terms of the amount of electricity delivered to the end user. Since electricity cannot be economically stored, its production and consumption are necessarily simultaneous and would be equal except for two factors: the amount used in the plants generating electricity, and the amount lost in delivering it to the users. The sum of these factors is thus unavailable to the consumers. In the US this unavailable element is about 20 percent of the total production, but in China, because of the poor condition of the generating and distribution facilities, it is estimated to be about 25 percent. Thus, in China proper only about 75 percent of the total estimated 1953 output of 4.1 billion kwh, that is 3.1 billion kwh, was available to the customer. The latter figure represents the total consumption.

A comparison with the US strikingly illustrates the present position of China proper. In 1902 the per capita use of electricity in the US was more than seven times the per capita use in China proper in 1953. The 1953 US figure was more than 300 times the China proper figure for the same year.

Data on which to establish a current use pattern in China proper were not available. In the absence of major transmission facilities, the division of available electricity among various users is strictly a local matter. The electricity must be used not only when but also where it is made. The information available on customers has been included in the plant list in Appendix A.

The following discussions give some details of the situation in Shanghai and Tientsin. These cities are two of the principal industrial centers. The pattern of use in them may not be considered as in any way typical of the whole of China proper.

B. Shanghai.

Shanghai, which was reported to have accounted for one-fifth of the total industrial output of Communist China in 1953, and one-third of its machine building industry, 19/ is short of electric power. The present government, in an effort to equalize the total demand over all hours of the day and week, 20/ has limited power to domestic users, 21/ and has scheduled the hours when electricity is available to various industries. In January 1954 a more detailed effort was being made to schedule various industries so as to increase the available power. 22/ In late 1953, additional captive industrial power plants were being connected to the city network, thus permitting them to contribute to the general supply. 23/ No appreciable expansion of facilities has been scheduled. These techniques have been the only source of additional electric power for industry.

It is estimated that in this area industrial usage still accounts for about 80 percent of the total use; 15 percent is residential and commercial use, and 5 percent is used by utilities, public transportation, and street lighting, as it was in 1940. 24/ Of this industrial usage cotton mills use over two-thirds, silk mills about one-twentieth, and flour mills, rubber mills, and tobacco mills are other important consumers.

C. Tientsin.

Tientsin, a city of over 2 million, is not only a center of both domestic and international trade but is also second only to Shanghai as a consumer goods manufacturing center. 25/ In early 1950, several small manufacturing concerns were moved from Shanghai to Tientsin, 26/ possibly in order to take advantage of a slightly more adequate public power supply. Starting in January 1952, work days were being staggered to even the load throughout the week. 27/ This effort has continued, and in 1953, domestic use of electricity for other than lighting purposes was effectively discouraged. The facilities were not adequate to handle the evening peak load, but apparently the industrial demand was met. 28/

The 1949 use pattern showed 60 percent going to industry, 29/ and this had probably increased to 70 percent or more by 1953. Of the industrial use, the textile industry and the chemical industry took about one-fourth each, and flour milling about one-tenth. The recent increase in steel and steel products as well as machinery manufacturing has probably caused these industries also to use significant fractions of the available supply.

VI. Input Requirements.

A. Coal.

The major input to the electric power industry in China proper is coal. Specific coal consumption -- that is, kilograms of coal consumed per kilowatt-hour produced (kg/kwh) -- varies widely, depending on the quality of the coal, the efficiency of the equipment, and the skill of the operators. In the US, the average specific coal consumption in public utility plants has declined from 0.863 kg/kwh in 1926, to 0.625 kg/kwh in 1939, to 0.498 kg/kwh in 1952. These figures are for more modern facilities and higher grades of coal than are available to many Chinese power plants. The data available for plants in China proper vary from 0.516 kg/kwh, claimed as a record by the Tang-shan plant, to 3, 4, or even more kg/kwh for small, obsolete plants. It is estimated that the average for China proper is about 1.1 kg/kwh (see Appendix B). Using the estimated 4-billion-kwh output from steam-powered plants in 1953, the total coal requirement of the electric power industry was 4.4 million tons, about one-fifth of the 25 million tons estimated to have been mined in the area.

The Chinese Communists have made a considerable effort to emulate the USSR in the use of low-grade fuels. The major direction which this effort has taken in China proper has been the use by some of the North China plants of slack and fines which had formerly been considered as waste at the coal processing plants. This may have resulted in some reduction of cost in the production of electric power, but, because of the complications it introduces, it could only decrease rather than increase the total output.

There is a requirement for transportation of fuel from the mines to the power plant. In China proper, some of the larger plants are located at or near the pit mouths. The plants in East China and along the southern coast historically met part of their requirements from domestic coal brought in by rail and waterways and part from coal brought in by coastal shipping, both from North China and from Indochina. Detailed information to establish the current magnitude of this transportation requirement has not been located.

B. Parts and Equipment.

The equipment for restoration and expansion of facilities must come largely from imports. This will be a major input requirement and is discussed below under Expansion.

Another class of requirements, that of repair and replacement parts, is most important in China proper, where almost all the equipment in use in 1953 was a heterogeneous collection, much of it secondhand and uncoordinated, manufactured in countries which no longer maintain normal trade relationships with Communist China. In an electric power plant there are many parts which require periodic replacement, and the frequency of replacement depends on the quality of the original part, the time it has been in use, and the care which was exercised in using it. The main equipment in an electric power plant is usually capable of long service without any major replacement of parts, but the auxiliaries are not so durable. Stoker parts and other parts of fuel- and ash-handling equipment require rather frequent replacement. Boiler tubes are an almost continuing requirement, very much dependent on the care taken in treating the boiler feed water, the impurities in the fuel fired, and the care taken in operation of the boiler. Bearing inserts and packing seals for all equipment wear out and require periodic replacement, and such parts as the turbine blades also must be replaced from time to time.

Any new electric power plant is routinely stocked with a store of spare parts, and the requirement for replacement parts continues, increasing from year to year throughout the life of the equipment. Since the domestic capability of China to produce many of these parts is severely limited, a continuing import of a wide range of replacement parts is essential to the satisfactory operation of the electric power facilities.

The requirement for these replacement parts in China proper at present is undoubtedly much higher than it is in the US because replacements were almost totally unavailable during World War II and the period which followed, and because failure to replace one part as it became worn accelerated the wear on the other parts. It is probable that this requirement for replacement parts has been, and will be, met largely by imports from the USSR and the European Satellites.

C. Personnel.

1. General.

It is estimated* that about 59,000 persons are in the employ of the public utilities in China proper, and that 12,000 persons are engaged in the operation of the captive industrial electric power facilities -- a total of 71,000 persons employed in the electric power industry. It is estimated that of this force, one-fourth are in the managerial class, including roughly all those who can read and write; one-fourth are skilled labor, including all those who can use even simple tools; and about one-half are unskilled labor. This force is a small fraction of the total industrial labor force in Communist China.

2. Technical Personnel.

One critical problem facing the present government in both its efforts to operate the existing electric power facilities and to erect new ones is the shortage of technically trained personnel. Most of the plants were originally installed by foreign nationals, and before 1937 the technical force was almost entirely from Europe and America. From 1937 to 1945, many of them were replaced by Japanese nationals, but even the technical supervisory force recruited in Japan

* For methodology, see Appendix B.

for work in China was not up to the standards the Japanese would have preferred. When the Chinese Communists took over in 1950, a major fraction of the technical force was made up of so-called White Russians -- emigres and their descendants, from the post-World War I period -- and Japanese. The Chinese Communists have replaced those members of both groups who were in responsible positions, presumably because of internal security considerations. As of December 1953 a total of only 6,000 Japanese nationals remained in Communist China, mostly in Manchuria. 30/ The Chinese Communist government must therefore currently rely on its own politically acceptable nationals as the major source of technical personnel. There does exist a body of Chinese who have received technical education in Western colleges and universities; this, however, automatically makes them politically suspect and ineligible for supervisory work.

In an effort to solve this problem, a major program for the education of engineers and technicians has been undertaken. Thirty-nine institutes of technology have been established, not including the colleges of technology in the 14 comprehensive universities. 31/ In the higher technical schools, courses dealing with heavy industry, including electrical engineering, are to be expanded first. In 1953, 68,000 students, over one-third of all college and university students, were in engineering schools. In the period 1950-53, more than 21,000 students graduated from these schools, in addition to 30,000 from technical schools. This is in contrast to the period 1927-47, during which only 30,000 graduated from higher technical schools and 50,000 from technical schools. 32/ The present government has thus reversed the traditional Chinese emphasis on classical education, and has greatly expanded the training of technicians and engineers.

The tendency is also to narrow the subjects. It was decided in September 1953 to replace the usual courses in electrical engineering with new specialization majors, machine making, power distribution network and transmission system, and hydraulic engineering on river structures and hydroelectric stations. This revision was at the suggestion of the Soviet experts Kusmin, Satovich, and Jamontsev, and was in part an effort to shorten the courses. 33/ Another effort in the direction of making technicians available earlier is the practice of "practical production work," in which undergraduate students work on production tasks in various factories and mines. 34/

In 1953, 28,000 engineering students in institutes of higher learning and 57,000 engineering students in secondary schools were engaged in this practical work. 35/ It was also reported that 559 selected Chinese students had been sent to colleges, institutes, and universities in the USSR. 36/

A number of references have been made to various schools teaching electrical engineering. Six hundred trainees were noted in February 1954 as enrolled in the new electrical school in Wu-han, Hupeh (Hu-pei) Province. 37/ The construction of a miniature multi-purpose hydroelectric project, 7 to 14 kw at Tsinghwa University just west of Peiping, in October 1953, was reported to be under the direction of K. Gorzienko, a Soviet expert attached to the university. 38/ This university was reported in 1952 as having an enrollment of 3,800 students, and as offering, in addition to the regular engineering courses, 2-year specialized courses in power plant engineering and in electrical engineering. 37/ A secondary technical institute of electrical engineering in Chungking (Ch'ung-ch'ing), Szechwan (Ssu-ch'uan) Province, was mentioned as recently established in October 1953. 40/ A Shanghai Power Industry School has been mentioned several times. 41/ The opening of the Central-South Electrical Engineering Institute on 1 April 1953, with an initial enrollment of 1,200 students, has been announced. 42/

The effectiveness of this effort is difficult to assess. Certainly the numbers and locations just mentioned indicate that it is, for China, a large-scale program with emphasis on immediate results. One drawback is the shortage of qualified instructors. Assignment of competent engineers to faculties further aggravates the existing shortage, and the few Soviet teachers involved in the program are of only limited assistance. Another possible drawback is the emphasis on immediate results, which certainly leads to a far narrower education than would be desirable. The adequacy of the education is further limited by the amount of time which must be devoted to political indoctrination at the expense of technical training. There is no doubt that the program will result in a far larger body of personnel with some technical training than has been the case in the past, however. Within 5 to 7 years the Chinese Communists should have a continuing supply of technical personnel for the minimum needs of the electric power industry.

The other source of technical supervisory personnel immediately available to the Chinese Communists is the USSR. So far as can be established, the only aid thus far furnished for the operation of existing facilities has been in the form of occasional visits by Soviet advisors and inspection teams. 43/ It appears that the total of such personnel is considerably less than 100. It appears that the USSR is furnishing the entire design, equipment, and personnel for the supervision of erection and initial operation. (See remarks on new plants in Appendix A.)

In summary, the Chinese Communists are now short of adequately trained personnel to supervise operation of existing electric power facilities. This shortage is reflected in somewhat lower efficiency of operation than would otherwise be the case, but it is in no sense crippling. Within about 5 years, the Chinese educational system should be furnishing an adequate number of graduates to meet the minimum requirements.

VII. Expansion.

A. Domestic Manufacture.

The first source from which the Chinese Communists may be expected to obtain equipment for any new electric power facilities is their own manufacturing industry. Rather frequent references have appeared in the Chinese press to the first manufacture of various types and sizes of equipment. These references provide at least an indication of the maximum sizes and ratings of equipment which they are capable of manufacturing.

Shanghai is the major center of electrical equipment manufacture in China proper. In September 1952, it was claimed that the Hua-t'ung Factory had successfully manufactured 33- and 69-kv oil circuit breakers. 44/ In July 1952, press comment was occasioned by the completion of a boiler and a 240-kw turbogenerator unit through the joint efforts of a shipyard, the electric utility, an electric motor plant, a construction company, and a machine factory. 45/ The Shanghai Boiler Factory, which has been mentioned several times, announced the completion in September 1953 of the first large steam boiler made in China, with a capacity of 18 tons per hour. 46/ This would be adequate to furnish steam to about a 4,000-kw turbogenerator. Production of a 6,000-kw turbogenerator was started in May 1953 with

the help of Czechoslovak technicians. 47/ In February 1954, work on this unit was mentioned as continuing in four separate factories, but no claim as to planned completion was made. 48/ In March 1954 it was announced that during the next 3 to 4 years these factories were scheduled for extensive renovation, which when completed would enable them to manufacture complete sets of 6,000-kw and 2,500-kw turbogenerators in quantities such that the total rating of a year's production would be about 250,000 kw. 49/ A small transformer works and a cable and wire plant are also reported in operation in Shanghai.

Outside of China proper the Chinese have major electrical equipment factories in Harbin (Ha-erh-pin) and Mukden (Shen-yang) in the Northeast. It was reported that in 1953 the machinery plant, the steel plant, and the machine tool plant working together were able to produce 10 hydroturbine generators, 1 of which was rated at 6,000 kva, which they had been attempting to manufacture for the previous 2 years, and that 10,000-kva water turbine units were planned. 50/ As of 1954, construction had been started on an electrical engineering plant, a boiler plant, a steam turbine plant, and an electric meter and apparatus plant in Harbin. 51/ In Mukden there is located a major transformer plant as well as an electric wire factory and facilities for the manufacture of high- and low-voltage switchgear. 52/ In 1953, a number of claims for the first manufacture of new large transformers were made, in May a 66-kv, 10,000-kva unit; in October a 110-kv, 13,500-kva unit; and in November a 44-kv, 20,000-kva unit. 53/ Electric power equipment manufacture in the Northeast has thus come a long way since the boast in 1951 of having successfully made an 800-kw hydroturbine generator unit. 54/

It may be concluded that before 1953 the Chinese Communists did not manufacture any significant amount of electric power generating and transmitting equipment; that in 1953 they did succeed in at least the pilot manufacture of boilers and turbogenerator units of about 2,500-kw rating, as well as transformers suitable for almost any application in China proper; and that in recognition of the requirement for more of this class of equipment, they are expanding their facilities for the manufacture of almost all types of equipment in the smaller ratings. It is estimated that the total addition to generating capacity in all Communist China from domestic manufacture was 5,000 kw in 1950, 15,000 kw in 1951, 25,000 kw in 1952, and 50,000 kw in 1953. It is further presumed that a major portion of this domestic output has been installed in the Northeast China area and not in China proper. The major expansion of manufacturing

facilities now in process is planned to result by 1958-60 in a domestic manufacturing capacity of the order of 300,000 kw of equipment each year. Much of this new manufacturing capacity will not be available until 1958 or later. It will be devoted mainly to smaller ratings of equipment, and will require the import of many components which the Chinese will not be able to manufacture.

B. Imported Equipment.

With its domestic manufacturing facilities severely limited now and for the next several years, Communist China has been forced to turn to other nations for the equipment for any major expansion of electric power facilities. With the international climate as it has been since 1950, the other nations of the Soviet Bloc have represented the only source.

1. USSR.

A credit of US $300 million was granted to Communist China by the USSR in February 1950 for the purchase of capital equipment, including power station equipment, over a 5-year period. In March 1953, it was announced that China and the USSR had recently signed a protocol to this agreement on credits to China and also a protocol on trade for 1953, and, of special interest, a separate agreement on Soviet assistance to Communist China in the expansion of operating power stations and the construction of new power stations. These agreements called for delivery to China in 1953 of equipment for power plants, as well as other types of equipment. 55/ It should be noted that this agreement on power stations was the only agreement announced covering a single type of installation, thus indicating the unique importance which the Chinese have attached to the expansion of power facilities. In September 1953, a number of announcements from both Moscow and Peiping heralded a new agreement between the two countries which apparently included the provisions of previous agreements. 56/

Summarizing these discussions, the aid covered the 10 years from 1949-59, during which a total of 141 major projects were to be constructed or renovated with the systematic economic and technical aid of the USSR. Of these, 50 had been in process before the date of the agreement and 91 were for subsequent work. Included were 24 thermalelectric and hydroelectric power plants to be reconstructed or built. In the case of all these plants the USSR would furnish the

design, supply the equipment, supervise the erection, and furnish personnel to train native Chinese operators. It was indicated that completion of the power plants would double the power-producing capacity of Communist China. On 23 January 1954, another protocol was signed at Moscow, covering -- among other things -- the supply of electric power generating equipment during 1954. 57/ Most of these agreements include some statement that China would, in turn, supply the USSR with nonferrous metals, soyabeans, rice, peanuts, vegetable oils, meat, tea, tobacco, fruit, wool, raw silk, silk piece goods, hides, and other products.

2. Other Sources.

Communist China has from year to year signed both trade and scientific-technical cooperation agreements with most of the European Satellites, which have apparently included electric power equipment and electrical engineering information. The fact that the 1953 delegation from China which negotiated these agreements was headed by Li Jen-chun, Vice Minister of the Ministry of Fuel Industry, is one indication of the importance of electric power equipment in these negotiations. 58/ The East Germans were working in 1953 on the design and fabrication of a 10,000-kw power station to be furnished to Communist China. 59/ In March 1954, China was reported to have ordered from Hungary power equipment for four stations. 60/ The Vasil Kolarov Plant in Bulgaria was reported in October 1953 as having shipped high-voltage electrical equipment to China. 61/ In addition, small quantities of equipment have been obtained from Western countries, partially through evasion of trade controls. It appears that as of 1954 the equipment received by China from countries other than the USSR has been, for the most part, auxiliary equipment and distribution equipment, which has been useful and necessary but which has not increased the total power generating equipment available.

C. Planned Expansion.

Electric power is identified among the heavy industries receiving primary emphasis under the Chinese Communist First Five Year Plan. 62/ Lenin's definition, "Communist -- that is Soviet power plus electrification of the whole country," has been taken to heart. At Lenin's initiative the USSR established the Commission for Elaborating the Plan for the Governmental Electrification of Russia (Goelro) in 1920, years before the first of the Five Year Plans was started in

1928. Following this example, plans for the expansion of electric power have had a prominent place in Chinese Communist efforts.

The continuing increase in the total annual Chinese Communist investment in the electric power industry is one indication of its importance. An approximate index, based on 1953, the first year of major investment, shows investments as follows: 1950, 5 percent; 1951, 9 percent; 1952, 23 percent; 1953, 100 percent; and 1954, 132 percent.* The total of the investment in coal and electric enterprises is planned to be more than half the total industrial investment in 1954. 66/

In 1953, 13 newly-built or expanded thermalelectric power stations and water turbine generators went into operation, including 6 projects constructed with the aid of the USSR. 67/ The 1954 Plans call for 160 projects of construction or reconstruction of power plants or transmission facilities, of which 8 are identified as receiving "all-out" assistance from the USSR. 68/ Included are 19 thermalelectric power plants, among them those in Fu-shun, Fuhsin (Fou-hsin), Tientsin, T'ai-yuan, Chungking, T'ung'chou, and Ch'eng-tu, and 2 hydroelectric plants, Ta-feng-man and Shih-lung-pa. Of these 21 power plant projects, it is planned to bring into partial operation a total of 10 thermalelectric and hydroelectric power stations. 69/

The discussion of 141 various industrial projects involving Soviet aid during the years 1949-59 listed Ta-feng-man, noted as largest, and thermalelectric plants at Fu-shun, Fuhsin, Harbin, and Dairen (Ta-lien) as planned, and at Sian, Lanchow (Lan-chou), Ta-yeh, and Paotow, (Pao-t'ou) as under construction. 70/ It will be noted that Ta-feng-man, and all the plants mentioned as planned, are in the Northeast.

* Taking capital construction in electric power facilities in 1950 as index 100, it was 175 in 1951 and 462 in 1952. The 1953 investment was planned as 440 percent of the 1952 investment. 63/ In 1954, investment in thermalelectric power plants was planned to be 21.8 percent greater than in 1953, and that in hydroelectric power plants, 42 percent greater. 64/ The total investment in fuel industry enterprises, coal, petroleum, and electricity, was planned to increase 32.17 percent as compared with 1953. 65/

The information given above on planned expansion refers to the total in the Chinese Communist area, whereas this discussion is concerned with only China proper. It should be noted that the first new plant announced as completed in 1952 by the Chinese Communists was in Northeast China, and that of the projects announced as completed in 1953, the two hydrogenerators and several of the other plants were in Northeast China. 71/ Most of the 141 projects to be erected with Soviet aid are in Northeast China. 72/ It should further be noted that, although the announced 1954 Plans refer in a similar fashion to Ta-feng-man, just south of Kirin in Northeast China, and to Shih-lung-pa just south of Kunming in Yunnan in Southwest China, Ta-feng-man contained two 70,000-kva generators when the Communists took it over, and they have since installed two 85,500-kva generators there; whereas Shih-lung-pa contained seven small generators totaling 2,940-kw, and it is presumed that the Communists intend to implement the Nationalist plan to install two 3,000-kw units. The same order of divergence in size between units installed in Northeast China plants as compared to plants in China proper also applies to the thermal facilities in the plans.

The regional allocation of these new facilities may be discussed on the basis of a recent series of articles on economic construction in the six administrative regions. 73/ "According to the provisions of the Five-Year Plan, a large number of... electric plants are being built in the Northeast, Northwest, and Southwest Regions."74/ "The Northeast Region is the base of heavy industry in the course of large-scale economic construction in the fatherland... within the next two years (note: 1954 and 1955)... four generating plants will be built or enlarged." 75/ Northeast China is without doubt the only section of China where integrated modern industry exists, and it is receiving a preponderance of new facilities.

"The natural environment of the Northwest Region is definitely favorable for economic development... . Preparations are being made to provide the power required for developing industry. The new thermo-electric plants in Sian and Tihwa have started to supply electricity." 76/ "The Southwest is a stretch of virgin territory, rich in... mineral resources, but not yet fully developed... . The construction of the No. 507 Chungking Power Plant is progressing rapidly." 77/ Efforts to develop this hinterland of China, the Northwest and Southwest Regions, and exploit their natural resources are to be expected as part of any Chinese plan. Because of the extreme lack of previous development, however, a power project which

would scarcely be worthy of mention if it were in Northeast China has increased the capacity of Northwest China several times. Southwest China is only slightly better situated, mainly as a result of the Nationalist effort in the years 1937-45. The first emphasis in this hinterland is on transportation and communication, for during at least the next decade the planned electric power facilities in these regions will be in proportion to the general industrial development and will not be comparable in size with those in the more developed areas of the country.

"North China is industrially a well developed area... . (In the Tientsin-Peking-Tangshan area) electric power... has been relatively well developed... the Shihchiachuang-Taiyuan industrial zone... is one of New China's important industrial bases." 78/ North China is the only section of China proper in which the expansion of power plants represents significant investment. Work was in progress in 1953 on eight power plants to total 50,000 kw, and work on another major plant was to be started in 1954. 79/ In view of the emphasis on heavy industry in the First Five Year Plan, the existing industries in this area provide a better base for heavy industrial as opposed to light industrial expansion than any other area in China proper.

"With its original industrial production... the East China Region is effectively supporting national large-scale economic construction." 80/ This statement is a reiteration of the established plan to work East China as hard as possible to furnish capital for other areas but to erect no facilities in this existing center of light industry. "The Central-South Region is China's 'land of fish and rice'... . In accordance with the First Five Year Plan, many cities... Tayeh... Wuhan... Canton... will develop into industrial cities." 81/ Some new electric facilities are apparently planned to support this industrialization, but on a rather modest scale.

The major emphasis in the First Five Year Plan of Communist China is on Northeast China. Among the areas in China proper, only North China is scheduled to receive any significant total of new electric facilities. The Central and South Area will have some new facilities installed. Northwest China and Southwest China receive prominent mention in present efforts because their present undeveloped character lends significance to any new industrial facility. East China will apparently receive only sufficient new electric facilities to permit it to continue to operate near its present high level.

One way to check on the increase in capacity is to total the estimated size of announced projects. The first major electric power facilities placed in service in China proper by the Chinese Communists totaled about 33,000 kw in 1953.* Projects planned for 1954 completion total about another 33,000 kw. Other announced projects for later completion, for which size estimates were possible, total about 130,000 kw. These announced projects add up to about one-sixth of the 1952 capacity. For some announced projects no information has been located from which to estimate magnitude, and there are undoubtedly others for which the location has not been announced; neither has been included in this total.

VIII. Capabilities, Vulnerabilities, and Intentions.

A. Capabilities.

The Chinese Communists recognize the importance of electric power in any planned industrial expansion. The available domestic sources of equipment for the expansion of electric facilities are extremely limited. The USSR is furnishing equipment in significant amounts. This equipment is essential to the present plans to expand industrial production. It is not being furnished in quantities which measurably affect Soviet domestic efforts, and it is apparently to be paid for over a continuing period by the export of foodstuffs, nonferrous metals, and other materials to the USSR.

The planned expansion of electric facilities in China proper as estimated herein is a comparatively modest program in view of the extreme needs of the area. The availability of coal and attractive hydroelectric sites will not limit any foreseeable development. Communist China will have no choice but to import a major portion of the equipment required for the estimated expansion. Presuming that the USSR continues to supply design, equipment, and technical supervision for the major new facilities, and that the terms on which this aid is furnished do not result in a major strain on the domestic economy of China, the electric power industry in China proper will expand at the estimated rate of over 8 percent per year.

* The figures in this paragraph are totals of projects noted in the plant list, Appendix A, wherein all available information on specific projects has been included.

B. Vulnerabilities.

The map indicates the striking concentration of the vitally important electric power facilities in a few key areas. Since 17.6 percent of the capacity of China proper is in a single plant of the Shanghai Power Company, and more than 4 percent is in the Shih-ching-shan Power Plant near Peiping, the destruction of only two power plants would deprive China proper of more than one-fifth of its electric power. With almost no transmission lines interconnecting areas, the destruction of power sources would immobilize dependent industry.

In 1954 and for some time to come, Communist China will be dependent on imports for almost all major equipment and most parts for it. This would compound the effect of any damage to major equipment, considerably delaying repairs. It also means that the loss of existing sources of new equipment and repair parts would, over a period of time, very much reduce the capability of existing facilities and would almost totally curtail any expansion.

C. Intentions.

Actions and plans in the field of electric power are valuable as indications of the intent to increase general industrial output and, to a lesser extent, of the intent to develop certain industries with a very high electric power requirement -- for example, aluminum refining. It is not in general possible to interpret the warlike or peaceful intentions of industrial developments from actions and plans in the field of electric power. The present pattern of location of new facilities confirms the primary emphasis on the development of heavy industry and, to a lesser extent, on the development of extractive industries to furnish raw materials.

APPENDIX A

TABULATION OF ELECTRIC POWER PLANTS IN CHINA PROPER

The following list in Table 4* includes all plants of 1,000-kw capacity and larger believed to exist in China proper at the end of 1953. It will be noted that certain plants in this list have dates of information listed as early as 1930. The rationale for including such plants is that in a number of cases recent interrogations of [redacted] coming out of the smaller communities have indicated that some of the plants installed at that time have neither been scrapped nor replaced and are still in operation. In view of the prevailing shortage of electrical energy throughout the area, it is believed that all available equipment has been repaired and kept in operation.

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The locating of plants by province and area has been done in accordance with the latest intelligence available (March 1954) on Chinese Communist political boundaries. Because a major source of information on new and expanded plants is the Chinese Communist press, which often locates a plant only by area or province and not by town, it is felt that the use of the latest boundary information will assist in locating some of these plants. The town name as given is shown with the spelling as approved by the Board of Geographic Names of the Department of the Interior, followed in parentheses by the conventional spelling, where one has been authorized. Under the column "Plant or Alternate Name," have been indicated other names for the locality and names under which the plant has appeared in various reports. This information has been included as an aid in identifying the installation in question, although it is realized that the present government is probably using a different identification for the installation. The coordinates indicated have been taken from the preliminary NIS Gazetteer -- China prepared by the Division of Geography, Department of the Interior, and published by the Central Intelligence Agency, 19 March 1952 -- now classified Official Use Only -- except for certain installations for which it is believed that the coordinates as given in the [redacted] 25X1A2g

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[redacted] published jointly by the Navy and the Air Force Office of Intelligence, more accurately reflect the location of the installation. The installed capacity is the total of the name-plate capacities of the equipment in the installation. In cases where this capacity was not indicated in reports, an estimate has been

* Table 4 follows on p. 39.

made and included, followed by "Estimated," indicating that the entry is an estimate. The column on frequency has been included because the use of 25-, 50-, and 60-cycle equipment in many areas of China reduces the possibility of interconnection. The year of information is, in general, the last year in which the facility has been identified as in operation. The distinction between a public utility and a captive industrial plant has been made on the basis of the name and the apparent function of the installation. The distinction is not rigorous and, in a number of cases, may be other than as indicated.

25X1A2g

Under "Remarks" has been included information on interconnection, customers, equipment installed, and fuel consumption, where it has been available, as well as other information of possible interest.

Table 4

Electric Power Plants in China Proper

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type a/	Year of Information	Control	[redacted]	Remarks
North China											
Hopeh (Ho-pei-Sheng)	A-1	Chang-chia-k'ou (Wan-chuan) (Kalgan)	Kalgan Electric Power Co. South Power Station (Nants' Aiyan)	40°50'N - 114°56'E	2,324		S	1947	PU c/		One 1,024-kw turbogenerator, one 800-kw turbogenerator, and one 500-kw turbogenerator. Note: The 2 larger units were reported damaged by the Communists in 1947 but are presumed to be now restored. 82/
	A-2	Ch'ing-yuan	Pao-t'ing Power Plant	38°52'N - 115°21'E	2,355	50	S	1947	PU		One 1,000-kw unit, one 880-kw unit, one 300-kw unit, and one 175-kw unit; 120 employees. 83/
	A-3	Ch'in-huang-tao	K'ai-luan Mining Administration Plant	39°55'N - 119°36'E	2,000	50	S	1948	CIP d/		Customers: Coal docks and town. Two 1,000-kw, 220-v, 50-cycle turbogenerators. 84/ Fuel consumption: 2.4 kg/kwh (1940) 85/
	A-4	Han-ku	Tung-yang Chemical Co.	39°15'N - 117°47'E	1,100	60	S	1941	CIP		86/
	A-5	Han-tan		36°35'N - 114°29'E			S	1953	PU		Planned to serve new cotton mills. 87/ Estimate a 6,000-kw plant to be completed in 1956.

a. S indicates steam power; H indicates hydropower; and D indicates diesel power.
b. World aeronautical chart (WAC).
c. Public utility (PU).
d. Captive industrial plant (CIP).

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	[redacted]	Remarks
North China (Continued)											
Hopeh (Ho-pei-Sheng) (Continued)	A-6	Hsia-hua-yuan	Hsuan Hua Power Plant	40°28'N - 115°15'E	27,400	50	S	1947	PU		Use: Industrial power 70 percent, lighting 12 percent (losses 18 percent). Fuel consumption: 0.85 kg/kwh. Four separate power houses. No. 1: One 1,400-kw, 3-kv, 50-cycle turbogenerator, and one 6-ton/hr, 14-kg/cm^2, 300°C boiler. No. 2: Two 1,500-kw, 2.2-kv, 50-cycle turbogenerators; one 1,000-kw, 2.2-kv, 50-cycle turbogenerator; and four 5-ton/hr, 14-kg/cm^2 boilers. No. 3: One 10,000-kw, 11-kv, 50-cycle turbogenerator; and one 2,000-kw, 3-kv, 50-cycle turbogenerator. No. 4: One 10,000-kw, 11-kv, 50-cycle turbogenerator; and one 40-ton/hr, 35-kg/cm^2, 440°C boiler. Note: As of 1947 only the 1,400-kw unit and the 10,000-kw unit in No. 3 were considered operable because of prior Communist damage. Distribution lines: 30 km at 77 kv and at 33 kv (2 lines) to Hsuan-hua (40°38'N - 115°06'E), thence 26 km at 33 kv to Chang-chia-k'ou (Kalgan) (40°50'N - 114°56'E), 40 km at 6.6 kv to Huai-lai (40°24'N - 115°44'E), thence 20 km at 3.3 kv to K'ang-chuang (40°22'N - 115°50'E). 88/

25X1A2g

Table 4
(Continued)

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
North China (Continued)	A-7	Hsing-lung	Manchuria Coal Co. Mine	40°28'N - 117°28'E	2,000		S	1945	CIP	Two 1,000-kw units. 89/ (The hsien in which this plant is located may now be included in Jehol Province.)
Hopeh (Ho-pei-Sheng) (Continued)	A-8	Lin-hsi	K'ai-luan Mining Administration Plant	39°42'N - 118°26'E	29,000	25	S	1945	CIP	Serves coal mines in entire area; portions of T'ang-shan and Ch'in-huang-tao. Since most of the load in these cities is 50-cycle this interconnection is of limited use. Fuel consumption: 1.96 kh/kwh (1940). One 11,000-kw, 2.2-kv, 25-cycle turbogenerator; two 6,000-kw, 2.2kv, 25-cycle turbogenerators; and two 3,000-kw, 2.2-kv, 25-cycle turbogenerators. 90/
	A-9	Liu-chiang	Liu-chiang Coal Mine	40°03'N - 119°32'E	3,000	60	S	1941	CIP	Fuel consumption: 4.1 kg/kwh (1932). Three 2.3-kv, 60-cycle turbogenerators. 91/
	A-10	Men-t'ou-kou	Chung-ying Coal Mine	39°56'N - 116°02'E	1,500	60	S	1941	CIP	92/
	A-11	Pei-p'ing (Peiping)	North China Electric Co., Peiping Plant	39°56'N - 116°24'E	1,830	50	S	1941	PU	93/
	A-12	Shih-ching-Shan	Shih-ching-Shan Power Plant	39°55'N - 116°08'E	55,000	50	S	1948	PU	Main Peiping supply. Fuel consumption: 1.54 lbs/kwh 0.70 kg/kwh (1951). One 5,000-kw, 5.7-kv, 50-cycle turbogenerator; one 10,000-kw, 5.7-kv, 50-cycle turbogenerator; one 15,000-kw, 5.2-kv, 50-cycle turbogenerator; and one 25,000-kw, 11-kv, 50-cycle turbogenerator. 77-kv tie to Tientsin and beyond. 94/

S-E-C-R-E-T

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
North China (Continued)										
Hopeh (Ho-pei-Sheng) (Continued)										
	A-13	Shih-ching-Shan	Iron Mill	39°55'N - 116°08'E	1,000	d-c	S	1941	CIP	Customers: Textile and flour mills, coke plant. 96/
	A-14	Shih-men	Shih-chia-chang Wei-shui Plant	38°02'N - 114°28'E	2,000	60	S	1944	PU	One 1,000-kw turbogenerator and one 1,500-kw turbogenerator. 97/
	A-15	Shih-men	Ta-hsing Cotton Textile Mill	38°03'N - 114°29'E	2,500	60	S	Prior 1944	CIP	Three 190 kg/kwh. 98/
	A-16	Shih-men-chai	Ch'ang-ch'eng Coal Co.	40°06'N - 119°36'E	1,500	60	S	1941	CIP	Serves coal mines. One 5,000-kw, 50-cycle turbogenerator. 99/
	A-17	Shu-ts'un	Feng-feng Mining Bureau Plant; Lin Shui Plant	36°33'N - 114°16'E	5,000	50	S	1950	CIP	Foundation for a 3,000-kw unit in Aug 1950. No further information. 100/
	A-18	Shu-ts'un	Chi-feng Plant Feng-feng Mining Bureau	36°33'N - 114°16'E	1,300		S	1950	CIP	One 500-kw and one 800-kw generator. Note: Both of these units are installed in separate caves with the boilers in another concealed installation. 101/
	A-19	T'ang-ku	Yung-li Chemical Works	39°01'N - 117°40'E	2,100	60	S	1941	CIP	6.83 kg/kwh. 102/
	A-20	T'ang-shan	Main Power Plant	39°38'N - 118°11'E	25,000	50	S	1949	PU	Fuel consumption: 0.516 kg/kwh (1953). One 10,000-kw turbogenerator; one 15,000-kw turbogenerator; and two 70-ton/hr boilers. This plant has frequently been cited in the press as very efficient. 77-kv tie via Ta-ku to Tientsin and beyond. 103/
	A-21	T'ang-shan	K'ai-luan Mining Administration Plant	39°38'N - 118°11'E	3,120	25	S	1941	CIP	1.96 kg/kwh. 104/

S-E-C-R-E-T

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
North China (Continued)										
Hopeh (Ho-pei-Sheng) (Continued)										
	A-22	T'ang-shan	Ch'i-hsin Cement Co.	39°38'N - 118°11'E	13,920	25	S	1941	CIP	One 1,120-kw turbogenerator and one 5,000-kw turbogenerator. Other equipment unknown. 105/
	A-23	T'ien-ching (Tientsin)		39°08'N - 117°12'E						City network is connected at 77 kv with Pei-p'ing and T'ang-shan. Customers: in 1950, 40 percent of load was residential and commercial and 60 percent was industrial, with textile mills predominating, and chemical industry, flour milling, and metallurgical industries also important in that order. 106/
	A-23	T'ien-ching (Tientsin)	Japanese No. 1		30,000	50	S	1949	PU	Two 15,000-kw turbogenerator units and two 80-ton/hr boilers. 107/
	A-24	T'ien-ching (Tientsin)	Power Plant Addition ('53('54) (Presumed to Japanese No. 1 Power Plant	39°08'N - 117°12'E			S	1953	PU	To city.108/ Estimate one 12,000-kw turbogenerator in August 1954. One additional 12,000-kw unit later.
	A-25	T'ien-ching (Tientsin)	British; No. 2 Power Plant		7,000	50	S	1949	PU	With city net. Two 1,000-kw units and two 2,500-kw units. 109/
	A-26	T'ien-ching (Tientsin)	Belgian Power Plant No. 3	39°09'N - 117°11'E	20,400	50	S	1948	PU	With city network. Two 3,000-kw turbogenerators, one 6,800-kw turbogenerator, and one 7,600-kw turbogenerator. 110/
	A-27	T'ien-ching (Tientsin)	French Power Plant	39°08'N - 117°12'E	9,200	50	S	1949	PU	With city network. Two 1,250-kw units, one 2,500-kw unit, and 1 4,200-kw unit. 111/

Table 4
(Continued)

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
North China (Continued)										
Hopeh (Ho-pei-Sheng) (Continued)										
	A-28	T'ien-ching (Tientsin)	Heng-yuan Textile Mill No. 2 Factory		4,000	60	S	1941	CIP	112/
	A-29	T'ien-ching (Tientsin)	Kung-ta No. 6 Plant No. 1 Factory		4,500	60	S	1942	CIP	113/
	A-30	T'ien-ching (Tientsin)	Kung-ta No. 6 Plant No. 2 Factory		2,500	60	S	1941	CIP	114/
	A-31	T'ien-ching (Tientsin)	Kung-ta No. 7 Plant No.2 Factory		7,600	60	S	1941	CIP	115/
	A-32	T'ien-ching (Tientsin)	Pei-yang Textile Mill No. 2 Factory		3,800	60	S	1941	CIP	116/
	A-33	T'ien-ching (Tientsin)	Shanghai Textile Mill		4,100	50	S	1941	CIP	117/
	A-34	T'ien-ching (Tientsin)	Tientsin Textile Co. No. 1 Factory		2,500	50	S	1942	CIP	118/
	A-35	T'ien-ching (Tientsin)	Tientsin Textile Co. No. 2 Factory		5,900	50	S	1941	CIP	119/
	A-36	T'ien-ching (Tientsin)	Tung-yang Paper Mill		2,500	50	S	1942	CIP	120/
	A-37	T'ien-ching (Tientsin)	Yu-feng Textile Co. No. 2 Factory		5,600	50	S	1941	CIP	121/
	A-38	T'ung-hsien (Peiping Area)	Electric Plant	39°55'N - 116°39'E	3,000	d-c	S	1941	PU	122/
	A-39	Kuan-t'ing	Kuan-t'ing Reservoir Power Plant	40°05'N - 115°45'E			H	1954	PU	Under construction in 1954. It will be ready for operation by the end of 1955 and will be fully in commission by 1956. From a statement that this plant will add 14 percent to the transmission network linking Peiping, Tientsin, and Tangsham, it is estimated that capacity of this plant will be approximately 20,000 kw. The reservoir has a storage capacity of 2,300 million cu m. The dam is 45 m high. 123/

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
North China (Continued)										
Shansi (Shan-hsi Sheng)	B-1	Hsin-chiang	North China Electric Co. Hsin-wei Plant	35°38'N - 111°13'E	1,000	50/60	S	1942	PU	124/
	B-2	Hsu-kou	Yu-tz'u Cotton Spinning Mill, Chin-hua Textile Mill, and Chia-hua Spinning Co.	37°31'N - 112°30'E	1,150	60	S	1948	CIP	Supplies city and textile mill. 125/
	B-3	K'ou-ch'üan-chen	Kouchuan Plant Meng Kiang Power Co.	40°00'N - 113°04'E	9,500		S	1947	PU	One 5,000-kw turbogenerator and one 4,500-kw turbogenerator. Note: It is presumed that these units were damaged by Chinese Communist (CC) forces in 1946-47 period. 126/
	B-4	P'ing-wang-ts'un	P'ing-Wang Plant of Menkiang Power Co. near Ta-t'ung	40°02'N - 113°09'E	17,000		S	1947	PU	One 15,000-kw turbogenerator and one 2,000-kw turbogenerator. Note: Believed damaged by CC action in 1946-47. 127/
	B-5	T'ai-yuan	In-City Power Plant No. 1 N.W. Industrial Co., City Power Plant, Hsin-chi Plant, Nan-hsiao-ch'iang-chieh No. 10 Power Plant	37°52'N - 112°33'E	5,750	60	S	1949	PU	With city distribution system. No. 1 300-kw, 60-cycle, 2.3-kv turbogenerator. No. 2 300-kw, 60-cycle, 2.3-kv turbogenerator. No. 3 1,150-kw, 60-cycle, 2.3-kv turbogenerator. No. 4 3,000-kw, 60-cycle, 2.3-kv turbogenerator, and No. 5 1,000-kw turbogenerator (under installation in 1949). Boilers: One 3-ton/hr, one 6-ton/hr, one 11-ton/hr, and 1 10-ton/hr (under installation in 1949). All are 190 psi, 660°F. 128/

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
North China (Continued)										
Shansi (Shan-hsi Sheng) (Continued)										
	B-6	T'ai-yuan	Locomotive Works, Power Plant No. 3, N.W. Industrial Co., Shansi Arsenal at Yang-ch'u	37°52'N - 112°33'E	1,000	60	S	1949	PU	With city distribution system. One 1,000-kw, 60-cycle, 2.3-kv turbogenerator. 129/
	B-7	T'ai-yuan	Steel Works Power Plant No. 4, N.W. Industrial	37°52'N - 112°33'E	16,000	60	S	1949	PU?	No. 1, 5,000-kw, 60-cycle, 2.3-kv turbogenerator; No. 2, 5,000-kw, 60-cycle, 2.3-kv turbogenerator; and No. 3, 6,000-kw, 60-cycle, 11-kv turbogenerator. Two 26-ton/hr, 450 psi, 800°F boilers, one 12-ton/hr, 200 psi, 550°F boiler, one 18-ton/hr, 200 psi, 550°F boiler, and two 6-ton/hr, 200 psi, 550°F boilers. 130/
	B-8	T'ai-yuan	Out-City Power Plant No. 2, N.W. Industrial Co., Suburban Power Plant, Peimen-wai Plant	37°52'N - 112°33'E	16,200 (12,000) (4,200)	50 60	S	1949	PU	With city distribution system. East section: No. 1, 4,000-kw, 50-cycle, 3.3-kv turbogenerator; No. 2, 3,000-kw, 60-cycle, 2.3-kv turbogenerator; and No. 3, 1,200-kw, 60-cycle, 2.3-kv turbogenerator. Boilers: Two 6-ton/hr, 240 psi, 700°F boilers, one 15-ton/hr, 240 psi, 700°F boiler, one 17-ton/hr, 240 psi, 700°F boiler, and one 18-ton/hr, 240 psi, 700°F boiler. West Section: No. 4, 5,000-kw, 50-cycle, 6.6-kv turbogenerator. Boilers: One 15-ton/hr, 240 psi, 700°F and one 25-ton/hr, 240 psi, 700°F. 131/ New unit (1953) 3,000-kw, 50-cycle turbogenerator. 132/

Table 4
(Continued)

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
North China (Continued)										
Shansi (Shan-hsi Sheng) (Continued)										
	B-9	T'ai-yuan	Taiyuan Power and Heat Plant	37°52'N - 112°33'E			S	1953	PU	To be completed in 1957 as one of 141 projects involving Soviet aid announced in the fall of of 1953. Statement that "it will triple the total electric power now generated" leads to estimate of 75,000-kw total final capacity for this plant. The statement of 1,000 tons of coal/day required also checks. One unit estimated at 12,000 kw is scheduled for Nov 1954 completion. 133/
Inner Mongolia										
Chahar (Ch'-ha-erh Sheng)			No plants larged than 1,000 kw							The Inner Mongolia Autonomous Region now includes what was formerly Chahar and Suiyuan Provinces in China proper and a section of Manchuria bordering on Outer Mongolia, a separate country. The electric power plants located in Suiyuan which was first combined with Inner Mongolia in the spring of 1954, have been included in the North China totals.
Suiyuan (Sui-yuan sheng) a/	D-1	Chi-ning	Pingtichuan Plant Meng Kiang Power Co.	40°57'N - 113°02'E	2,200		S	1947	PU	One 1,400-kw turbogenerator, one 800-kw turbogenerator. Note: This plant may have been damaged by the Civil War in 1946-47. 134/

a. Before 1954, in the North China area.

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
Inner Mongolia (Continued)										
Suiyuan (Sui-yuan Sheng) (Continued)	D-2	Kuei-sui	Kweisui Plant, Suiyuan Electric Power Co., Meng Kiang Electric Co., Hou-ho Plant, Yuan-ho Plant, Inner Mongolian Electric Enterprises	40°47'N - 111°37'E	1,850	50	S	1947	PU	Fuel consumption: 2.6 kg/kwh. One 850-kw, 2.3 kv, 50 cycle turbogenerator, one 1,000-kw, 3.3-kv, 50-cycle turbogenerator. 75 employees. 135/
	D-3	Pao-t'ou	Pao-t'ou Electric Power Co.	40°36'N - 110°03'E	2,500	50	S	1947	PU	Fuel consumption: 2.9 kg/kwh. One 1,000-kw, 3.3-kv, 50-cycle turbogenerator, one 1,500-kw, 600-kv, 50-cycle turbogenerator, and four boilers, hand fired, natural draft. 120 employees. 136/
	D-4	Pao-t'ou	New Power Plant	40°36'N - 110°03'E			S		PU	This has been indicated as the site of one of the major power plants to be furnished to China by the USSR. 137/
East China										
Anhwei (An-hui Sheng)	E-1	Fo-tzu-ling	Hydroelectric Plant at Futseling Reservoir on Huai River	31°21'N - 116°17'E			H		PU	Planned for 5 hydroturbine generators, total 8,000-kw capacity. Two 1,000-kw units planned for 1954 installation. All equipment to be of Chinese manufacture. 138/ The plant, with normal rainfall, is expected to generate 8,000 kw/day for 9 months and 2,000 kw for the remaining 3 months. 139/
	E-2	Huai-ning	Shen Hui Electric Light Co., Anhwei Electric Co., Anking, An-ch'ing	30°31'N - 117°02'E	1,520		S	1948	PU	Planned increase in operating efficiency reported for 1954 but no new equipment. 140/

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
East China (Continued)										
Anhwei (An-hui Sheng) (Continued)										
	E-3	Ma-an-shan	South Anhwei Electricity Works, Wan-nang Power Co.	31°43'N - 118°29'E	10,000	50	S	1948	PU	Two 5,000-kw, 50-cycle, 6.9-kv turbogenerators and three 26-ton/hr, 455 psi, 750°F boilers. 141/
	E-4	Pang-fou	Pengpu	32°57'N - 117°21'E	1,500	50	S	1949	PU	One 500-kw turbogenerator and one 1,000-kw turbogenerator. 142/ 2.3-kv line to T'ien-chia-an (32°40'N - 117°00'E) 143/ 144/
	E-5	Wu-hu	Ming-yuan Electric Power Co.	31°21'N - 118°22'E	2,240	50	S	1948	PU	
Chekiang (Che-chiang Sheng)		Hang-chou (Hangchow)	Hangchow Electricity Co.	30°15'N - 120°10'E				1947	PU	Customer demand: Wood pulp and paper, 3,100 kw; cotton textile, 1,500 kw; silk, 2,000 kw; textile machine manufacturing, 1,000 kw; and calcium carbide, 1,000 kw (?) Fuel consumption: 0.824 kg/kwh. 145/
	F-1	Hang-chou (Hangchow)	Kensharmen Plant Hangchow Electric Co.		2,000	50	S	1948	PU	One 2,000-kw, 5.25-kv, 50-cycle unit, two 4-ton/hr, 175 psi, 520°F boilers. 13.2-kv tie with Zakow. 146/
	F-2	Hang-chou (Hangchow)	Zakow Plant, Hangchow Electric Co., Cha-k'ou Plant	30°13'N - 120°08'E	15,000	50	S	1948	PU	Two 7,500-kw, 13.2-kv, 50-cycle units and two 40-ton/hr, 365 psi, 720°F boilers (one 600-kw, non-condensing, house-service unit). 13.2-kv tie with Kensharmen. 147/
	F-3	Wu-hsing	Wu-hsing Electric Light Corp.	30°52'N - 120°06'E	1,750	50	S	1934	PU	Customer: 3 silk mills (1950). 148/

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	[redacted]	Remarks
East China (Continued)											
Chekiang (Che-chiang Sheng) (Continued)											
	F-4	Yin-hsien	Yuen Yao Electric Power Co., Ningpo	29°53'N - 121°33'E	9,520	50	S	1947	PU		149/
	F-5	Yung-chia (Wenchow)	P'u-hua Power Plant	28°01'N - 120°39'E	1,096	50	S	1952	PU		One turbogenerator and three diesel generators. 150/
Fukien (Fu-chien Sheng)		Fu-chou (Foochow)	Foochow Electric Co., Min-hou, Foochow Power Co.	26°05'N - 119°18'E			S	1948	PU		Customers: Rice mill, flour mill, saw mill, spinning and weaving mill machinery. Fuel consumption: 0.82 kg/kwh (1936). 151/
	G-1	Fu-chou (Foochow)	No. 1 Station, Foochow Power Co.		2,000	60	S	1949	PU		Two 1,000-kw, 2.3-kv, 60-cycle units. 6.9-kv tie No. 2 Station. 152/
	G-2	Fu-chou (Foochow)	No. 2 Station, Foochow Power Co.		8,000 (5,000) (3,000)	 50 60	S	1949	PU		One 3,000-kw, 2.3-kv, 60-cycle unit and one 5,000-kw, 50-cycle unit. Boilers: One 16-ton/hr, 425 psi, 780°F and one 26.5-ton/hr. 153/
	G-3	Hsia-men (Amoy)	Amoy Electric and Power Co.	24°27'N - 118°05'E	3,800	60	S	1947	PU		Fuel consumption: 1937; 2.5 lb/kwh, 1.14 kg/kwh: 1946; 6.5 lb/kwh, 2.95 kg/kwh. Two 1,500-kw turbogenerators and one 800-kw unit. 154/
	G-4	Ku-t'ien	Hyuroelectric Plant	26°36'N - 118°48'E			H		PU		The hydraulic structure for this project had been started by the Nationalists in 1948 but equipment had not been procured. Despite a covert report of completion, the absence of any press mention leads to the conclusion that the power station is not completed. 155/

Table 4
(Continued)

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
East China (Continued)										
Kiangsu (Chiang-su Sheng)	H-1	Chen-chiang	Commission on the Readjustment of Water and Electric Power Industries, Ta-ch'ao Electric Co.	32°13'N - 119°26'E	2,450	50	S	1947	PU	Fuel consumption: 1.39 kg/kwh (1939) 156/
	H-2	Chiang-tu	Chen-yang Electric Power Co., Yang-chou, Central China Electric and W.W. Co., Ch'in-yang Power Plant, Yangchow	32°24'N - 119°26'E	3,500	50	S	1947	PU	157/
	H-3	Ch'i-shu-yen	Tsishuyen Electric Works, Yangtze Power Co., Ch'eng Hua Electric Mfg. Co., Chin-hua Plant	31°44'N - 120°04'E	19,600	50	S	1948	PU	Customers: Cotton and flour mills and irrigation. Three 3,200-kw turbogenerators, one 7,500-kw turbogenerator, and one 2,500-kw turbogenerator. Boilers: two 7.5-ton/hr, four 10-ton/hr, one 30-ton/hr, and one 40-ton/hr. 33-kv double circuit to Wu-hsi (31°35'N - 120°18'E) Wu-chin (31°47'N - 119°58'E). Staff 190, workers 450. Total, 640 employees. 158/
	H-4	Chu-jung	China Portland Cement Co., Lung-t'an Cement Factory	31°56'N - 119°10'E	2,580	50	S	1932	CIP	Fuel consumption: 1.40 kg/kwh (1932).159/
	H-5	Hsu-chou	Hsu-chou Electric Power Plant	34°16'N - 117°11'E	2,086	50	S	1947	PU	Customer: 1/2 of output to coal mine. 160/
	H-6	Nan-ching (Nanking)	Capital Electric Works, Yangtze Power Co., Hsia-Kuan, Shou Tu Electric Light Co., Hsiakwan Power Plant	32°05'N - 118°44'E	36,000	50	S	1948	PU	Customers: 45 percent lighting, cement and flour mills. Fuel consumption: 1.07 kg/kwh (1948), 0.64 (1950). Two 5,000-kw turbogenerators, two 10,000-kw turbogenerators, and three 2,000-kw turbogenerators. Boilers: Two 28-ton/hr, two 50-ton/hr, and two 19-ton/hr. Staff, 293; workers, 499; total, 792 13.2-kv dist. 161/

Table 4
(Continued)

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
East China (Continued)										
Kiangsu (Chiang-su Sheng) (Continued)										
	H-7	P'u-k'ou	T'ien-ching P'u-k'ou Railroad	32°07'N - 118°43'E	1,200	50	S	1944	CIP	One 1,999-kw turbogenerator, one 200-kw steam engine generator unit, and three boilers. 6.6 kv to Pu-chen. 162/
		Shang-hai (Shanghai)	Public Utilities General	31°14'N - 121°28'E						Customer: 25 percent residential and commercial and 75 percent industrial. Of industrial, over half cotton mills. Electric power has been and is in 1954 in short supply with various restrictions and rationing regulations in force. 22 kv city dist. 163/
	H-8	Shang-hai (Shanghai)	Riverside Plant Shanghai Power Co.	31°16'N - 121°33'E	229,000	50	S	1950	PU	Fuel consumption: 0.545 kg/kwh (1953). 164/ Two 2,000-kw turbogenerators, two 3,000-kw turbogenerators, One 5,000-kw turbogenerator, four 10,000-kw turbogenerators, one 15,000-kw turbogenerator, one 15,500-kw turbogenerator, two 18,000-kw turbogenerators, three 20,000-kw turbogenerators, one 22,500-kw turbogenerator, and one 25,000-kw turbogenerator. 165/
	H-9	Shang-hai (Shanghai)	Chapei Electric and Water Works Co.	31°21'N - 121°31'E	34,500	50	S	1948	PU	One 12,500-kw turbogenerator, two 10,000-kw turbogenerators, and one 2,000-kw turbogenerator. 166/ (1 new unit planned for installation). 167/

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
East China (Continued)										
Kiangsu (Chiang-su Sheng) (Continued)										
	H-10	Shang-hai (Shanghai)	Compagnie Francaise de Tramways et d'Eclairage Electrique de Shanghai: French Co.	31°13'N - 121°28'E	18,000	50	D	1948	PU	Serves French Concession Area. Two 960-kw diesel generators, two 2,640-kw diesel generators, one 2,800-kw diesel generator, and one 8,000-kw diesel generator. 168/ This plant taken over by the government on 2 Nov 1953. 169/
	H-11	Shang-hai (Shanghai)	Pootung Electric Supply Co., P'u-tung Electric Co., Peotung Co.	31°14'N - 121°28'E	2,500	50	S	1948	PU	Serves area east of Whangpo River. 75 percent output to industrial user, primarily textiles and paper. One 2,500-kw, 50-cycle, 6.3-kv turbogenerator, and two 9-ton/hr, 27-kg/cm^2, 367°C boilers. 170/
	H-12	Shang-hai (Shanghai)	Chinese Electric Power Co., Nan-tao Co., Nan Shih Co.	31°12'N - 121°29'E	4,000	50	S	1948	PU	Serves area to the south of the French concession. Two 2,000-kw turbogenerator units. 171/
	H-13	Shang-hai (Shanghai)	Lunghwa Cement Works, Portland Cement Works, Lung-hua Portland Cement Works	31°14'N - 121°28'E	1,400	50	S	1948	CIP	This plant has at times leased its entire output to the utility in the area. One 1,440-kw, 50-cycle, 525-kv turbogenerator and five boilers. 172/
	H-14	Shang-hai (Shanghai)	British American Tobacco Shop		4,500		S		CIP	P'u-tung area across Whangpoo from Shanghai. Three 1,500-kw turbines. Three x Bellis Morcomb steam engines and generators of unknown size. 173/

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
East China (Continued)										
Kiangsu (Chiang-su Sheng) (Continued)										
	H-15	Shang-hai (Shanghai)	China Printing and Finishing Co.	31°14'N - 121°30'E	4,100	50	S	1947	CIP	Opposite International Settlement across Huang-p'u. One turbogenerator 2,500-kva, 380-v, 50-cycle, 6,000/1,000 rpm with combined condenser. Three BW water tube boilers, each with 42" diameter, 15,600-lb, steam capacity, and 275 psi. Other unknown equipment. 174/
	H-16	Shang-hai (Shanghai)	Japan China Cotton Spinning and Weaving Co.	31°14'N - 121°30'E	2,000	50	S	1944	CIP	On the P'u-tung side of the Huang-p'u River, Shanghai. One BBC turbogenerator, 2,000-kw, 200 psi, 590°F, 2,300 v. Three Sulzer-gabe type boilers with automatic stokers. 175/
	H-17	Shang-hai (Shanghai)	Yung An Textile Manufacturing Co.	31°14'N - 121°30'E	4,400	50	S	1944	CIP	Fuel consumption: .56 kg/kwh. 176/
	H-18	Shang-hai (Shanghai)	Cheng T'ai Cotton Mill	31°14'N - 121°30'E	1,000		S		CIP 177/	Note: No reliable data have been located on cotton mills in the Shanghai Area having their own power plants. This list is believed to indicate at least the approximate significance of such installations. It is not known which of these plants are connected to the power system, but it is indicated that they are being connected and will supply power to the Shanghai electrical industry administration. 185/
	H-19	Shang-hai (Shanghai)	Heng Feng Cotton Mill	31°14'N - 121°30'E	2,198		S		CIP 178/	
	H-20	Shang-hai (Shanghai)	Hou Sheng Cotton Mill	31°14'N - 121°30'E	2,787		S		CIP 179/	
	H-21	Shang-hai (Shanghai)	Hung Yu Cotton Mill	31°14'N - 121°30'E	1,650		S		CIP 180/	
	H-22	Shang-hai (Shanghai)	San Hsin Cotton Mill	31°14'N - 121°30'E	1,270		S		CIP 181/	
	H-23	Shang-hai (Shanghai)	Shen Hsin Cotton Mill	31°14'N - 121°30'E	1,010		S		CIP 182/	
	H-24	Shang-hai (Shanghai)	Ta Feng Cotton Mill	31°14'N - 121°30'E	1,000		S		CIP 183/	
	H-25	Shang-hai (Shanghai)	Wei Tung Cotton Mill	31°14'N - 121°30'E	2,000		S		CIP 184/	

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
East China (Continued)										
Kiangsu (Chiang-su Sheng)(Continued)										
	H-26	Wu-chin	Wu-chin Electric Power Co.	31°44'N - 120°04'E	3,500	50	S	1947	PU	13.8-kv transmission. 186/
	H-27	Wu-chin	Shen Hsin Cotton Mill No. 6	31°47'N - 119°58'E	1,300		S	1933	CIP 187/	
	H-28	Wu-hsi	Wu-hsi Plant, Tsiahuyen Electric Works, Yangtze Power Co.	31°35'N - 120°18'E	2,000		S	1949	PU	One 2,000-kw turbogenerator. Installation of this unit was not complete in 1949. 188/
	H-29	Wu-hsi	Ching Fun Plant, Ch'ing Feng Cotton Mill	31°35'N - 120°18'E	4,000		S	1948	CIP 189/	
	H-30	Wu-hsi	Sun Hsin Plant, Chen Hsin Cotton Mill	31°35'N - 120°18'E	4,000		S	1948	CIP 190/	
	H-31	Wu-hsien (Soochow)	Soochow Electric Light and Power Co.	31°18'N - 120°37'E	11,800	50	S	1948	PU	Customers: Rice mill, 2,000-hp; silk weaving mill, 1,400-hp; flour mill, 1,300-hp; cotton mill, 900-hp; and others, 2,000-hp. Turbogenerators: One 3,600-kw, 50-cycle, 2.3-kv; one 5,000-kw, 50-cycle, 2.3-kv; and one 3,200-kw, 50-cycle, 2.3-kv. Boilers: One 20-ton/hr, 400 psi; one 20-ton/hr, 225 psi; and one 22-ton/hr, 225 psi. Fuel consumption: 1.41 kg/kwh. Tie 16.8 kv to Wu-hsi (31°35'N - 120°18'E) and to Hsin-teng (29°58'N - 119°44'E). 191/
	H-32	Wu-hsien (Soochow)	Su Lung Cotton Mill	31°18'N - 120°37'E	2,500	50	S	1944	CIP	One 2,500-kw, 50-cycle, 600-v turbogenerator and two 30-kg/cm^2, 420°C boilers. 192/

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	[redacted]	Remarks
East China (Continued)											
Shantung (Shan-tung Sheng)											
	I-1	Chi-nan (Tsinan)	Chi-nan Electric Light Co., Li-ch'eng Plant, Tsinan Plant	36°40'N - 117°00'E	18,400	50	S	1948	PU		193/
	I-2	Chi-nan (Tsinan)	Ch'eng-t'ung Textile Mill	36°40'N - 117°00'E	2,000	50	S	1941	CIP 194/		
	I-3	Chi-nan (Tsinan)	Jen-feng Textile Mill	36°40'N - 117°00'E	1,250	50	S	1941	CIP 195/		
	I-4	Ch'ing-tao (Tsingtao)	Ssu-fang, Szefang, Tsingtao Electricity Works	36°07'N - 120°20'E	40,000	50	S	1948	PU		Customers: Textile mills, water works. Two 15,000-kw, 50-cycle, 11-kv turbogenerators, two 5,000-kw, 50-cycle, 11-kv turbogenerators, four 40-ton/hr, 400-psi, 800°F boilers, and four 8-ton/hr, 200-psi, 575°F boilers. 196/
	I-5	Ch'ing-tao (Tsingtao)	Mill No. 1, Tsingtao Textile Industry, NRC	36°04'N - 120°19'E	8,750	50	S	1948	CIP 197/		
	I-6	Ch'ing-tao (Tsingtao)	Mill No. 2, Tsingtao Textile Industry, NRC	36°04'N - 120°19'E	11,750	50	S	1942	CIP 198/		
	I-7	Ch'ing-tao (Tsingtao)	Mill No. 5, Tsingtao Textile Industry, NRC	36°04'N - 120°19'E	4,000	50	S	1942	CIP 199/		
	I-8	Ch'ing-tao (Tsingtao)	Mill No. 6, Tsingtao Textile Industry, NRC	36°04'N - 120°19'E	5,000	50	S	1948	CIP		200/
	I-9	Ch'ing-tao (Tsingtao)	Tsingtao Hua Hsing Textile Co.	36°04'N - 120°19'E	1,700	50	S	1948	CIP		201/
	I-10	Hsi-ho	Hai-ho, Tzu-po Mining Bureau, Shan-tung Coal Mine Bureau	36°30'N - 117°55'E	2,000	50	S	1950	CIP		202/
	I-11	I-hsien	Chung Hsing Coal Mine	34°46'N - 117°35'E	4,640	50	S	1941	CIP		Fuel consumption: 1.14 kg/kwh (1940). Two 1,600-kw, 50-cycle, 3-kv turbogenerators and two 720-kw steam engine driven generators. 203/

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
East China (Continued)										
Shantung (Shan-tung Sheng) (Continued)										
	I-12	Po-sha...	Shantung Coal Mine Bureau	36°31'N - 117°51'E	13,000	50	S	1950	PU	One 5,000-kw turbogenerator, two 3,000-kw turbogenerators, and two 1,000-kw turbogenerators. 204/
	I-13	Ssu-shui	Hua-feng Plant	35°39'N - 117°15'E	1,000	50	S	1941	CIP	Fuel consumption: 3.36 kg/kwh (1940). Customer: Coal mine. 205/
	I-14	Tzu-ch'uan	Lu-ta Coal Co. Mine	36°41'N - 117°57'E	8,500	50	S	1942	CIP	Fuel consumption: 1.87 kg/kwh (1940). 206/
	I-15	Yen-t'ai (Chefoo)	Chefoo Light Co., Shen Min Electric Co., Sheng Ming Electric Light Co., Sung Ming Electric Co.	37°34'N - 121°24'E	5,400	50	S	1947	PU 207/	
Central and South China										
Honan (Ho-nan Sheng)										
	J-1	Cheng-hsien	Cheng-chou Electric Power Co., Ming-yuan Electric Co.	34°45'N - 113°40'E	4,000		S	1950	PU 208/	
	J-2	Cheng-hsien	New Chengchow Power Plant (outside city)	34°45'N - 113°40'E	12,000 (Estimated)		S	1953	PU	Customers: No. 1 and No. 3 textile mills and a new flour mill, vegetable oil mill, and other new plants. USSR furnished equipment and supervision of erection. First boiler and turbogenerator installed in Oct 1953. Formal completion Jan 1954. Three times existing plant in size. 209/ Note: Three times 4,000 kw = 12,000 kw.
	J-3	Cheng-hsien	Yu Feng Cotton Mill	34°45'N - 113°40'E	3,500	60	S	1932	CIP 210/	
	J-4	Hsin-hsiang	North China Electric Co. Plant	35°19'N - 113°52'E	2,000 (1,000) (1,000)	60 50 60	S	1943	PU 211/	
	J-5	K'ai-feng	Pulin Electric Light Co., P'u-lin Power Plant, Puling Power Co.	34°51'N - 114°21'E	3,000		S	1949	PU 212/	

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	[redacted]	Remarks
Central and South China (Continued)											
Honan (Ho-nan Sheng) (Continued)											
	J-6	Kung-hsien	Arsenal	34°51'N - 113°00'E	2,200	50	S	1932	CIP 213/		Fuel consumption: 3.52 kg/kwh (1940). 2.2-kv generation. 214/
	J-7	Liu-ho-kou	Liu-ho-kou Coal Mine	36°14'N - 114°01'E	2,000	25	S	1941	CIP		At a state-owned coal mine s.w. of Anyang County in Honan Province, four boilers, two generators, and other accessory equipment have been installed. 215/
	J-8	Nan-wan	Nan-wan Reservoir	32°08'N - 114°04'E			H	1953	PU		Planned 1955 completion. Will provide 9,000,000 kwh annually. Using 8,000 hr/year operation. 216/ Estimated capacity, 1,000 kw.
Hunan (Hu-nan Sheng)											
	K-1	Ch'ang-sha	Ch'ang-sha Plant, Hunan Power Co.	28°12'N - 112°59'E	13,000	50	S	1948	PU		In 1948: One 1,000-kw, 6.3-kv, 50-cycle unit and one 2,500-kw, 6.3-kv, 50-cycle unit. Two 6-ton/hr, 28-kg/cm², 400°C boilers; one other dismantled but with most parts in the vicinity in 1948 and presumed to be now installed, the following: One 7,500-kw, 6.6-kv, 50-cycle unit, one 2,000-kw, 6.6-kv, 50-cycle unit, two 25-ton/hr, 325-psi, 735°F boilers, and one 18-ton/hr, 325-psi, 735°F boiler. 33-kv tie to Hsiang-t'an Plant. 217/

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
Central and South China (Continued)										
Hunan (Hu-nan Sheng) (Continued)										
	K-2	Ch'ang-sha	South Plant	28°12'N - 112°58'E	2,750	50	S	1950	CIP	Customers: Spinning factory and antimony smelters. Four turbo-generators. 218/
	K-3	Heng-yang Shih	Hengyang Plant, Hunan Power Co.	26°54'N - 112°36'E	1,000	50	S	1948	PU	One 1,000-kw, 6.3-kv, 50-cycle unit and one 6-ton/hr, 28 kg/cm^2, 400°C boiler. 219/
	K-4	Hsiang-t'an	Hunan Power Co., Hsiashesze, Sha-shih-tze, Chu-chow, Siangtan	27°51'N - 112°54'E	6,000	50	S	1948	PU	One 1,000-kw, 6.3-kv, 50-cycle unit, one 6-ton/hr, 28 kg/cm^2, 400°C boiler, and one 5,000-kw unit (under erection in 1948). 220/ (The second power plant of the Central Hunan Electric Bureau will be expanded in 1953 so as to increase the present generating capacity 2.5 times.) 221/ Note: Probable 9,000-kw expansion.
	K-5	Yang-ch'i	Hsiang-mei Power Co., Yang-ch'i-ch'iao	27°40'N - 111°11'E	3,000		S	1948	PU 222/	

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
Central and South China (Continued)										
Hupeh (Hu-Pei Sheng)										
	L-1	I-ch'ang	Power Plant	30°42'N - 111°17'E	1,000		S	1951	PU	Two 500-kw turbogenerators. 223/
	L-2	Ta-yeh	Tayeh, Old Plant; South Hupeh Power Co.	30°05'N - 114°58'E	11,000	50	S	1950	PU	Two 3,000-kw, 50-cycle, 3.3-kv turbogenerators, two 20-ton/hr, 28 kg/cm^2, 400°C boilers, 224/ and one 5,000-kw turbogenerator. 225/ Customers: Cement mill, 6,000-kw demand; iron mine, 2,500-kw demand; textile mills, 1,000-kw demand; and coal mines. 226/ Three 5,000-kw turbogenerators. 227/
	L-3	Shih-hui-yao	New Tayeh Plant, South Hupeh Power Co., Sheng-chia-yun	30°13'N - 115°06'E	15,000		S	1949	PU	
	L-4	Han-k'ou (Hankow)	Hankow Waterworks and Electricity Co., Chi Chi Hydro Corp.	30°35'N - 114°14'E	15,000 (10,500) (4,500)	60 50	S	1947	PU	Fuel consumption: 1.79 kg/kwh, (1947). Three 1,500-kw, 2.3-kv, 60-cycle units, two 3,000-kw, 2.3-kv, 60-cycle units, one 2,000-kw, 6.6-kv, 50-cycle units, one 2,500-kw (presumed 50-cycle) unit, and seven 160-psi boilers and two 400-psi boilers. 228/
	L-5	Han-k'ou (Hankow)	Hankow Light and Power British, Yin Shan Electric Corp.	30°35'N - 114°16'E	3,750	d c	S	1947	PU	One 2,500-kw dc unit and one 1,250-kw dc unit. 229/ A Feb 1952 report indicates that this dc service may be discontinued. 230/

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
Central and South China (Continued)										
Hupeh (Hu-pei Sheng) (Continued)										
	L-6	Wu-han	No. 1 Wuhan Power Plant	30°35'N - 114°16'E	6,000 (Estimated)		S	1953	PU	One generator was installed in May 1953 and started operation in Jul 1953. It may be located at Wu-han or Te-yeh. 231/
	L-7	Han-k'ou (Hankow)	Fu-hsin Flour Mill	30°35'N - 114°16'E	3,000	50	S	1944	CIP	Customer: Fu Hsin Flour Mill and Sung Hsing Cotton Mill. One 3,000-kw, 3.3-kv, 50-cycle generator. 232/
	L-8	Wu-ch'ang	Wuchang Plant, So. Hopeh Power Co., Wuchang Electric Light Co.	30°32'N - 114°18'E	3,500	50	S	1948	PU	Customer: Textile mills in area. Two 500-kw turbogenerators and one 2,500-kw turbogenerator. 233/
	L-9	Wu-ch'ang	Tali Cotton Mill	30°32'N - 114°18'E	4,000	60	S	1932	CIP 234/	
Kiangsi (Chiang-hsi Sheng)										
	M-1	Chiu-chiang	Kiukiang Yinlu Electricity and Waterworks Co., Yanglu	29°44'N - 115°59'E	1,750	50	D	1948	PU	One 750-kw diesel unit, 2,300-v, 50-cycle. One 1,000-kw diesel unit ordered but not installed in 1948, to be installed in 1949. (2,000-kw generator reported by Nationalists as in transit to this station. Disposition of this generator is unknown.) 235/
	M-2	Kan-hsien	Kanchow, Kan-chou	25°51'N - 114°56'E	1,224	50	S	1952	PU	One steam turbine and one steam engine driven generator, 2.3 kv. 236/

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
Central and South China (Continued)										
Kiangsi (Chiang-hsi Sheng) (Continued)										
	M-3	Nan-ch'ang	Nanchang Power Co., Kai Ming Electric Light Co.	28°41'N - 115°53'E	8,200		S	1952	PU	Fuel consumption: 0.708 kg/kwh (1952). One 2,100-kw, 2.3-kv, 50-cycle generator, one 1,100-kw, 2.3-kv, 50-cycle generator, and one 5,000-kw, 6.6-kv, 50-cycle generator. This 5,000-kw unit was on order in 1948 and subsequent reports of a new boiler and turbogenerator unit installed in 1951 have been presumed to refer to this unit. 237/
	M-4	P'ing-hsiang	P'ing-hsiang Coal Mine	27°37'N - 113°51'E	3,750	50	S	1932	CIP	Customer: Coal mine. 238/
Kwangsi (Kuang-hsi Sheng)										
	N-1	Chung-shan	P'ing-kuei Mining Bureau, Ho-hsien, Pa-pu, Fu-ch'uan	24°32'N - 111°18'E	3,200	50	S	1947	PU	Customers: Tin mines and collieries. 239/
	N-2	I-shan	Coal Mine Co.	24°30'N - 108°40'E	3,200	50	S	1938	CIP	Customer: Coal mine. 240/
	N-3	Liu-chou	Liuchow Power Co.	24°19'N - 109°24'E	2,500	50	S	1953	PU	Fuel consumption: .743 kg/kwh. One 2,000-kw, 6.6-kv generator. One 500-kw generator. 241/ 1953 information confirms size. 242/
	N-4	Wu-chou (Wuchow)	Wu-chou Electric Co., Ts'ang-wu	23°29'N - 111°19'E	1,000	50	D	1934	PU	One 1,000-kw, 50-cycle, 3.3-kv diesel generator. 243/
Kwangtung (Kuang-tung Sheng)										
	P-1	Chan-chiang (Fort Bayard)		21°12'N - 110°23'E	1,000 (Estimated)			1953	PU	As of 1948 this plant's capacity was 840 kw. 244/ New generator reported installed in 1953. 245/

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
Central and South China (Continued)										
Kwangtung (Kuang-tung Sheng) (Continued)										
	P-2	Chung-shan	Ti-kuang-an-chi Electric Power and Light Co.	22°22'N - 113°35'E	2,000	60	S	1939	PU	Fuel consumption: 1.09 kg/kwh (1932). 246/
	P-3	Kuang-chou (Canton)	Saichuen, Hsi-ts'un, New Plant, Sai-chuan	23°08'N - 113°13'E	30,000	50	S	1952	PU	Two 15,000-kw with 13.2-kv (installed 1937). Three boilers of 56,000 kg/hr each, 36 kg/cm², 425°C. 13.2-kv tie to Wu-hsien-men.
	P-4	Kuang-chou (Canton)	Wu-sen-men, Wu-hsien-men, Old Plant	23°06'N - 113°15'E	22,000	60	S	1948	PU	Two 6,000-kw units, one 5,000-kw unit, and two 2,500-kw units. Boilers: Two 80,000 lb/hr and two 40,000 lb/hr. 247/ All boilers are 225 psi, 574°F. 248/
	P-5	Kuang-chou (Canton)	Nan-shih-tao, Nao-sek-tao	23°07'N - 113°15'E	5,000		S	1948	PU	One 5,000-kw unit under erection in 1948, 3.3 kv. Removed from Taiwan. Boilers total three 28,600 lb/hr, 328 psi, 617°F. 249/
	P-6	Kuang-chou (Canton)	Ho-nan		2,000	60	D	1948	PU	Two 1,000-kw units. Probably replaced by Nan-shih-tao. 250/
	P-7	Nan-hai	Kuang-hua Electric Co.	23°02'N - 113°07'E	1,250	60	S	1939	PU 251/	
	P-8	Pai-hsih-ch'ien	Pai-shin Cement Works	24°17'N - 113°30'E	1,650	50	S	1932	CIP	One 1,500-kw, 50-cycle, 525-v generator (steam turbine driven). One 150-kw, 50-cycle, 525-v generator (diesel driven). 252/ (Steam presumed.) 253/
	P-9	Shan-t'ou (Swatow)	Ch'ao-shan Railroad Plant	23°22'N - 116°40'E	2,000	50	S	1947	CIP	
	P-10	Shan-t'ou (Swatow)	K'ai-ming Electric Light Co.	23°22'N - 116°40'E	2,020	50	D	1949	PU	One 820-kw, 50-cycle, 3.1-kv diesel generator, one 200-kw, 50-cycle, 3.1-kv diesel generator, and one 1,000-kw, 50-cycle, 3.1-kv diesel generator. 254/ New generator noted as under installation in 1953. 255/
	P-11	Shun-te	Kuang Chung	22°50'N - 113°14'E	2,900	50	S	1947	PU 256/	

S-E-C-R-E-T

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
Central and South China (Continued)										
Hainan Island (Hai-nan Tao)										
	P-12	Hai-k'ou		20°03'N - 110°19'E	1,360		D	1948	PU 257/	
	P-13	Tung-fang	Lokoshing, Tung-fang-hsu, Ch'ang-chiang	19°02'N - 108°58'E	5,600	60	H	1948	PU	One 7,000-kw water turbine and one 7,000-kva generator, 60 cycle, 11 kv. 258/ (Steam and public utility presumed.) Two 1,000-kw generators; also in this vicinity are two other small plants, one 700-kw total and one 650-kw total. 259/
	P-14	Yu-lin	Jih-t'ieh Electric Power Plant, An-yu, San-ya	18°14'N - 109°30'E	2,000		S	1948	PU	
Southwest China										
Kweichow (Kuei-chou Sheng)										
	Q-1	Hsiu-wen	Kweiyang Power Co., Hydro Plant, Suiwen, Shuchen	26°51'N - 106°35'E	2,500		H S	1948	PU	Two 750-kw water wheels. One 1,000-kw steam turbogenerator tie to Kweiyang Power Plant 33 kv 33 km. 260/
	Q-2	Kuei-yang	Kweiyang Power Co. 3rd Plant	26°35'N - 106°43'E	1,000		S	1948	PU	One 1,000-kw turbogenerator and one 405 psi boiler. Plants No. 1 and No. 2 of this company are in Kuei-yang and have an installed capacity of 520 kw each making the company's total installed capacity 2,040 kw. 261/
Sikang (Hsi-k'ang Sheng)										

No Plants over 1,000 kw

S-E-C-R-E-T

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Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	[redacted]	Remarks
Southwest China											
Szechwan (Ssu-ch'uan Sheng)											
	S-1	Ch'ang-shou	Lower Tsing Yuan Tung Plant, Lung-ch'i-ho Plant	29°50'N - 107°04'E	6,050	50	H	1953	PU		One 1,550-kw, 6.9-kv, 50-cycle unit, one 750-kw, 6.9-kv, 50-cycle unit and one 3,000-kw unit (installed Dec 1953). Note: Tou Wha Chi Plant just n.w. of this plant has three 292-kw, 6.9-kv, 50-cycle units, total 876 kw. 262/ Note: About 20 reports of other hydroelectric plants in Szechwan Province have been located but no definite information on their size and location has been found.
	S-2	Ch'eng-tu	Ch'i-ming Light Co.	30°40'N - 104°04'E	3,500	50	S	1948	PU		443 employees. Operates two other small plants. Three turbogenerator units and four boilers. 263/ A new plant probably 1,000 kw or larger is scheduled for 1954 completion in Ch'eng-tu. 264/
		Ch'ung-ch'ing (Chungking)	Chungking Power Co., General Information	29°34'N - 106°35'E			S	1948	PU		Customers: Spinning and weaving, 2,000 kw; paper and pulp, 1,000 kw; rice and flour mills, 1,000 kw; and machinery manufacturing, 500 kw. Fuel requirement: 1.5 kg/kwh. 333 staff and 929 workers. Total 1,262 employees. 265/
	S-3	Ch'ung-ch'ing (Chungking)	Chungking Power Co., Ta-chi-kou Station, No. 1 Station, City Station	29°34'N - 106°35'E	4,500	50	S	1948	PU		One 4,500-kw, 50-cycle, 5.25-kv generator and one 29-ton/hr, 265 psi, 750°F boiler. 266/

Table 4
(Continued)

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
Southwest China (Continued)										
Szechwan (Ssu-ch'uan Sheng) (Continued)										
	S-4	Ch'ung-ch'ing (Chungking)	Chungking Power Co., Tan-tze-shih, No. 2 Station (on south bank)		2,000	50	S	1948	PU	Two 1,000-kw, 50-cycle, 5.25-kv generators. 267/
	S-5	Ch'ung-ch'ing (Chungking)	Chungking Power Co., Oh-king-ai / Ngo-kung-ya, No. 3 Station		4,500	50	S	1948	PU	One 4,500-kw, 50-cycle, 5.25-kv generator and one 29-ton/hr, 265 psi, 750°F boiler. Fuel requirement: 1.5 kg/kwh. 268/
	S-6	Ch'ung-ch'ing (Chungking)	No. 507 Power Plant				S	1953	PU	To be the largest plant in Southwest China. Using Soviet equipment and technical help. Estimated intended capacity 12,000 kw. Note: Scheduled for Mar 1954 partial operation. 269/
	S-7	Ch'ung-ch'ing (Chungking)	20th Arsenal		3,000	50	S	1948	CIP	One 1,000-kw, 5.25-kv unit and one 2,000-kw, 6.9-kv unit. One 160 psi, 530°F boiler and one 425 psi, 740°F boiler. 270/
	S-8	Ch'ung-ch'ing (Chungking)	21st Arsenal		3,540	50	S	1948	CIP	One 2,000-kw, 6.9-kv unit, two 1,000-kw, 3.0-kv units, and one 540-kw, 6.9-kv unit. One 19-ton/hr, 425 psi, 740°F boiler and one 5-ton/hr, 170 psi, 550°F boiler. 271/
	S-9	Ch'ung-ch'ing (Chungking)	24th Arsenal		4,500 (3,500) (1,000)	 50 60	S	1948	CIP	One 1,500-kw, 2.3-kv, 50-cycle unit, one 2,000-kw, 2.3-kv, 50-cycle unit, and two 500-kw, 2.3-kv, 60-cycle units. Two 7.5-ton/hr, 29-kg/cm^2, 400°C boilers and two 7.5-ton/hr, 22 kg/cm^2, 300°C boilers. 272/

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
Southwest China (Continued)										
Szechwan (Ssu-ch'uan Sheng) (Continued)										
	S-10	Ch'ung-ch'ing (Chungking)	50th Arsenal, Tanshiato		3,250	50	S	1948	CIP	One 1,250-kw, 2.3-kv unit and one 2,000-kw, 2.3-kv, 50-cycle unit. Four 5-ton/hr, 25 kg/cm^2, 400°C boilers. 273/
	S-11	Ch'ung-ch'ing (Chungking)	Central Paper Manufacturing Works		1,000	50	S	1948	CIP	One 1,000-kw, 5.25-kv, 50-cycle unit. 274/
	S-12	Ch'ung-ch'ing (Chungking)	Iron and Steel Works, Yu Shing Steel Works		3,000	50	S	1948	CIP	Two 1,500-kw, 5.25-kv, 50-cycle units. Seven 3.6-ton/hr, 11.3 kg/cm^2, 475°F boilers and one 5.5-ton/hr, 11.3 kg/cm^2, 475°F boiler. 275/
	S-13	Ch'ung-ch'ing (Chungking)	Yu Fung Cotton Mill Yu Foong Cotton Mill		1,440	60	S	1948	CIP	One 1,440-kw, 60-cycle unit. Two 5-ton/hr, 200-psi, 530°F boilers. 276/
	S-14	Ch'ung-ch'ing (Chungking)	Yu Hwa Cotton Mill		2,000	50	S	1948	CIP	One 1,000-kw, 4,000-v, 50-cycle unit and two 500-kw, 400-v, 50-cycle units. Four 2.5-ton/hr, 200 psi, 500°F boilers and two 6-ton/hr, 500 psi, 700°F boilers. 277/
	S-15	Ch'ung-ch'ing (Chungking)	Yu Sing Textile, Army Supply Textile, Yu Shing Cotton Mill		1,600	60	S	1948	CIP	Two 800-kw, 3.3-kv, 60-cycle units. 278/
	S-16	I-pin	I-pin Power Co.	28°46'N - 104°34'E	6,000	50	S	1948	PU	Main industrial load is paper mills. Fuel requirement: 1.176 kg/kwh (1948). One 6,000-kw, 6.6-kv, 50-cycle unit. Two 12-ton/hr, 32.8 kg/cm^2, 400°C boilers. 279/

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	[redacted]	Remarks
Southwest China (Continued)											
Szechwan (Ssu-ch'uan Sheng) (Continued)											
	S-17	Lu-hsien	Luhsien Electricity Works	28°53'N - 105°23'E	2,000	50	S	1948	PU		Fuel requirement: 1.25 kg/kwh. One 2,000-kw, 2.3-kv, 50-cycle generator. One 5.5-ton/hr, 24 kg/cm^2, 390°C boiler. 53 staff, 61 technical workers, 115 laborers; 219 total. 280/
	S-18	Pa-hsien	Pahsien Power Co., Li-chia-to, NRC Plant	29°29'N - 106°32'E	1,000	50	S	1948	PU		Customers: Woolen mills, motor car repair works, cotton textile co. Fuel consumption: 1.562 kg/kwh. One 1,000-kw, 50-cycle, 6.6-kv generator. One 6.5-ton/hr, 20.5 kg/cm^2, 400°C boiler. One additional 1,000-kw generator was planned for 1949 installation. 281/
	S-19	P'eng-hsien	Tukiang Power Co., P'u-yang	30°59'N - 103°56'E	2,000	50	S	1948	PU		An additional unit of 5,000 kw may have been installed. One 2,000-kw, 6.3-kv, 50-cycle generator. Two 8-ton/hr, 410 psi, 750°F boilers. 282/
	S-20	Wan-hsien	Wan-hsien Electricity Works	30°49'N - 108°24'E	1,496	50	H S D	1948	PU		One 500-kw turbogenerator set with one 3.6-ton/hr, 21.1 kg/cm^2, 371°C boiler. One 340-kw diesel driven, 2.3-kv, 50-cycle unit. One 160-kw hydro, 380-v, 50-cycle unit, one 136-kw hydro, 2.3-kv, 50-cycle unit, and one 360-kw hydro, 6.6-kv, 50-cycle unit. 283/

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	[redacted]	Remarks
Southwest China (Continued)											
Szechwan (Ssu-ch'uan Sheng) (Continued)											
	S-21	Wu-t'ung-ch'iao	Minkiang Electricity Works	29°21'N - 103°51'E	2,000	50	S	1948	PU		Customers: Mines, paper mills, chemical works, and cement mills. One 2,000-kw, 6.9-kv, 50-cycle generator. One 6-ton/hr, 22 kg/cm^2, 375°C boiler. 83 staff, 315 workers, total 398 employees. 284/
Yunnan (Yun-nan Sheng)											
	T-1	Hui-tse	Third Hydro Plant, Tung-ch'uan Mining Bureau	26°21'N - 103°25'E			H	1953	CIP		Under construction. Exact location unknown. Estimated ultimate capacity, 10,000 kw. 285/
	T-2	K'ai-yuan (A-mi)		23°42'N - 103°14'E	1,440		H	1949	CIP		Two 720-kw generators. Customer: Tin mines. 286/
	T-3	Ko-chiu	Tin Mine Plant	23°23'N - 103°09'E	3,000		S	1953	CIP		Two 1,500-kw (estimated) generators (one installed May 1953 - and one installed in Nov 1953). 287/ (Estimate based on statement "Twice total previous output" which was 1,470 kw.)
		K'un-ming	Kunming Lakeside Electricity Works	25°04'N - 102°41'E			S	1948	PU		Fuel consumption: 0.9 to 1.1 kg/kwh. 93 staff, 354 labor, total 447 employees. 288/
	T-4	K'un-ming	Ma-kai-tze Plant, K'un-ming Lakeside Electricity Works	25°04'N - 102°41'E	4,000	50	S	1948	PU		Two 2,000-kw, 6.9-kv, 50-cycle generators. Two 4.8-ton/hr, 24 kg/cm^2, 375°C boilers. Also one 250-kw and one 100-kw diesel set. An additional 5,000-kw generator may be installed. 289/

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
Southwest China (Continued)										
Yunnan (Yun-nan Sheng) (Continued)	T-5	K'un-ming	Shih-lung-pa Hydroelectric, Chilungpa, Yao-lung, Yaoling Power Co., Power Plant No. 1, Hydro Plant, K'un-ming Lake, Yunnan Lake	24°46'N - 102°37'E	2,940	50	H	1949	PU	Customers: 60 percent industrial and 40 percent Mun. and Light. Water wheels: two 750-kw, one 440-kw, and four 250-kw. 290/ Reference in Mar 1954 to plans to expand the Shih-lung-pa Hydroelectric Plant leads to the estimate that it is intended to implement the old Nationalist plans and install two additional 3,000-kw units in this plant; work to start in 1954 with completion probably subsequent to 1955. 291/.
	T-6	K'un-ming	Yao-lung Power Co., Plant No. 2, City Steam Plant	25°04'N - 102°41'E	2,500	50	S	1949	PU	Customers: Two cotton mills used 75 percent of output. One 1,250-kw turbogenerator unit. Two boilers (adequate) and one 1,250 in Hong Kong for shipment in Nov 1950. 292/
	T-7	T'eng-ch'ung		25°02'N - 98°28'E	1,020		H	1947	CIP	On Tieh-shui Ho, near completion in 1947. Presumed now operable. Two 600-kva hydroturbine generators. 293/
	T-8	Yang-lin	P'en-shui-tung (water fall cave) Plant, K'un-ming Lakeside Electric Works	25°12'N - 103°04'E	2,000	50	S	1948	PU	One 2,000-kw, 6.9-kv, 50-cycle generator. One 4.8-ton/hr, 24-kg/cm^2, 375° boiler. 294/

Table 4
(Continued)

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	Remarks
Northwest China										
Kansu (Kansu-Sheng)										
	U-1	Lan-chou (Lanchow)		36°03'N - 103°41'E	1,974	50	S	1948	PU	One 1,000-kw turbogenerator, one (unknown kw) turbogenerator, and four steam engine driven generators. 295/ One new steam plant and 1 hydroelectric plant are planned. 296/
Ningsia (Ning-hsia Sheng)			No Plants Larger than 1,000 kw							
Shensi (Shen-hsi Sheng)										
	W-1	Hsi-an (Sian)	Hsi-ching Power Plant	34°16'N - 108°54'E	2,275	50	S	1948	PU	Two turbogenerator units, 2.3 kv. Four boilers. 297/
	W-2	Hsi-an (Sian)	Sian Power Plant No. 2	34°16'N - 108°54'E	6,000 (12,000 planned) (Estimated)		S	1953	PU	30-kv transmission line connects to Hsian-yang (34°22'N - 108°42'E) 1951 plans called for installation of two 6,000 kw. Work started 4 Nov 1952. Soviet designed, furnished equipment, and supervised erection. Pulverized coal fired No. 1 generator started 9 Oct 1953. 298/ Two 3,000-kw units. 299/
	W-3	Hsi-an (Sian)	Chen Feng Flour Mill	34°16'N - 108°54'E	6,000		S	1944	CIP	
	W-4	Hsi-an (Sian)	Ta-Hua Cotton Mill	34°16'N - 108°54'E	4,500		S	1940	CIP	One 2,000-kw unit and one 2,500-kw unit. 300/

Table 4
(Continued)

25X1A2g

Area and Province	Serial Number	Place Name	Plant or Alternate Name	Coordinates	Installed Capacity (kw)	Frequency	Type	Year of Information	Control	[redacted]	Remarks
Northwest China											
Sinkiang (Hsin-chiang Sheng)											
	X-1	Urumchi (Ti-hua)		43°48'N - 87°35'E	2,225		S	1952	PU		One 2,000-kw unit reported installed in 1952. 301/ Two 112-1/2-kw units (locomobiles) installed in 1951. 302/
	X-2	Urumchi (Ti-hua)	Ti-hua Power Station (new)	43°48'N - 87°35'E	4,000	50	S	1953	PU		Design started in 1952. Soviet design, equipment, and supervision of erection. 18 times original Ti-hua station, 1.4 times entire province. Completed 30 Dec 1953. (18 x 225 kw = 4,050 kw; 1.4 x 2,800 kw = 3,920 kw) 303/
Tsinghai (Ch'ing-hai Sheng)				No Plants Larger than 1,000 kw							
Tibet											
	Z-1	Lhasa	Hydro Plant	29°39'N - 91°06'E			H	1950	PU		Four 125-kw units in process of erection. 304/

APPENDIX B

METHODOLOGY

1. General.

Because there was available no valid information more recent than 1936 about total capacity and output in China proper, the first research in connection with this report was the establishment of the plant list, from which totals of capacity were derived. In an effort to estimate the total output of power in the area, this capacity information was then correlated with various claims of output. The information on individual facilities was used to estimate the various inputs required by the industry. The resources available for expansion of the industry were analyzed, and estimates of probable future expansion were based thereon.

2. Coal Requirement Estimate.

Available data on coal consumption by individual plants were included in the plant list in Appendix A. Because of the limited amount of this information available, it was extrapolated as follows: Weighted averages were calculated for plants in each significant size class. These averages were plotted and an approximate curve used to adjust variation from trend. Values from the curve were used with the data from Table 2,* giving the percentage of capacity in plants of each size class. Thus was derived a weighted value of average coal consumption per kilowatt-hour in China proper, of 1.1 kg/kwh.

3. Labor Requirement.

This estimate of personnel requirement is an extrapolation of the reported strength of the labor force at the several plants for which data were located and included in the plant list, and of the data in a Chinese Nationalist report dated 1947. 305/ From these data, factors indicating employees required per 1,000 kw of capacity in plants of each size range were calculated separately for public utility and for captive industrial plants. These factors were then multiplied by the total capacity reported for plants in each size range,

* P. 16, above.

and the total employees required were then added. The breakdown by type of employee was a rough average of the breakdown as it appeared for various plants.

It is estimated that because of the limited data on which this estimate is based, it is subject to a range of error of approximately plus or minus 30 percent.

The total employment here indicated is many times that which would be required in the US for the operation of similar facilities. Common labor is used for many functions normally performed mechanically in the US.

4. Capacity and Output Estimate.

The output for the years 1951-53 is estimated in Table 5.* The capacity for 1953 was taken as the total of the plants listed in Appendix A plus a small allowance for plants with a capacity smaller than 1,000 kw and for unreported plants. The individual projects, completed and planned, were totaled, and an arbitrary estimate was made for projects which it was not feasible to estimate individually and for unreported projects. This new capacity was apportioned over the years through 1957 in what was believed to be a reasonable fashion. The previously estimated capacity and output for the years 1951-53 were used to calculate the hours of use in those years. Since the Chinese Communists in all 3 years were making a concerted effort to increase the utilization of the existing facilities, and since during these years there was only a small increase in the hours of use, it is believed that in the subsequent period this factor would not increase much more than about 3 percent per year. The output was calculated from the estimated capacity and utilization factors for the years 1954-57.

5. Evaluation of Chinese Claims and Derivation of Output Estimates, 1950-53.

The present government has made no public claims regarding the electric power output of China proper. There have been occasional press reports of percentage plans and of plan fulfillment for various administrative areas, but the information has been too scattered to be of use in establishment of the total output or that of the individual

* Table 5 follows on p. 109.

Table 5

Detailed Estimate of the Capacity and Output of Electric Power Plants in China Proper 1951-57

Year	Year-End Capacity (Million Kilowatts)	Increase During Year (Million Kilowatts)	Average Capacity Available (Million Kilowatts)	Estimated Margin of Error a/ (Percent) Minus	Estimated Margin of Error a/ (Percent) Plus	Kilowatt-Hours per Installed Kilowatt (Thousand Hours)	Estimated Margin of Error a/ (Percent) Minus	Estimated Margin of Error a/ (Percent) Plus	Output (Billion Kilowatt-Hours)	Estimated Margin of Error a/ (Percent) Minus	Estimated Margin of Error a/ (Percent) Plus
1951	1.285 b/	0.008 c/	1.281 d/	10	10	2.89 e/	30	20	3.70 f/	40	30
1952	1.301 b/	0.016 c/	1.293 d/	10	10	3.06 e/	20	25	3.95 f/	35	35
1953	1.334 g/	0.033 h/	1.317 d/	10	10	3.11 e/	20	30	4.09 f/	25	40
1954	1.384 i/	0.050 j/	1.359 d/	10	15	3.20 k/	20	30	4.35 l/	30	50
1955	1.454 i/	0.070 m/	1.419 d/	15	20	3.30 k/	25	35	4.68 l/	35	60
1956	1.549 i/	0.095 m/	1.501 d/	15	30	3.40 k/	30	35	5.10 l/	40	80
1957	1.674 i/	0.125 m/	1.611 d/	20	40	3.50 k/	30	40	5.64 l/	45	100
Total		0.397									

a. Estimated margin of error assigned by estimating extreme limits of the value in question based, for 1953 and previous years, on general information on the level of the economy and the reliability of reports, and for 1954 and subsequent years on the error in 1953 figures plus the possible results of changes in plans.
b. Derived by subtracting increase during subsequent year from total of subsequent year.
c. Arbitrarily estimated that small and unreported plants increased the total capacity by 8,000 kw in 1951 and by 16,000 kw in 1952.
d. Average available capacity estimated by subtracting one-half of the increase in capacity during the year from the year-end capacity.
e. Calculated by dividing the output by the average available capacity.
f. Estimated from Chinese Communist statistics in Table 6.*

* Table 6 follows on p. 111.

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Table 5

Detailed Estimate of the Capacity and Output of Electric Power Plants
in China Proper
1951-57
(Continued)

g. 1,299,400 kw of plants as listed in Appendix A, plus an estimated 35,000 kw installed in plants smaller than 1,000 kw, plus other unreported plants.
h. The estimated total capacity of plants noted in Appendix A as having been completed in 1953.
i. Derived by adding increase during year to total of previous year.
j. 33,000 kw total estimated capacity of plants noted in Appendix A as planned for completion in 1954, plus 17,000 kw for plants unreported and for which no estimate was made in the appendix.
k. The value for hours in 1954-57 is an arbitrary estimate of probable increase in utilization over the previous year.
l. The output for the years 1954-57 has been estimated as the product of the previously estimated average capacity available for the hours of use.
m. 130,000 kw estimated total capacity of plants noted in Appendix A as planned in 1953 for 1955 and subsequent completion, plus 160,000 kw for plants for which no estimate was made, apportioned over 1955, 1956, and 1957.

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Table 6

Output of Electric Power in Communist China 306/
1949-54

Billion Kilowatt-Hours

Year	Northeast	China Proper	Total Communist China
1949	1.68 a/	3.21 b/	4.89 c/
1950	2.05 a/	3.13 b/	5.18 c/
1951	2.75 a/	3.70 b/	6.45 c/
1952	4.06 a/	3.95 b/	8.01 d/
1953	5.84 e/	4.09 b/	9.93 f/
1954			11.40 g/

a. Output in Northeast expressed as a percentage of the "preliberation peak" output was 1949, 36.7 percent; 1950, 44.6 percent; 1951, 60.0 percent; and 1952, 88.4 percent. 307/ The maximum "preliberation peak" output was 4.59 billion kwh in 1944. The total output in 1944 of the Manchuria Electric Company, steam and hydroelectric, The Pen-ch'i Coal and Iron Company, the An-shan Steel Works, and other plants was 4,589,538,000 kwh. 308/ This output was somewhat larger than the 1943 output and has therefore been used in preference.

b. The China proper output in each year is the difference between the total Communist China output and the Northeast output.

c. Output expressed as an index referred to 1949 was 1950, 106 percent; 1951, 134 percent; and 1952, 164 percent. 309/ This series was used with the calculated 1952 output to calculate the other outputs.

d. Output in China proper in 1936 was 2.44 billion kwh (public utility generation, 1,721,305,000 kwh plus industrial power plants' generation, 721,032,000 kwh), 310/ output in Manchuria in 1944 was 4.59 billion kwh (see b, above), the total "preliberation Peak" output was therefore 7.03 billion kwh. The 1952 output was 114 percent of the "preliberation peak" output. 311/

e. The planned output in the Northeast for 1953 was 144 percent of the 1952 output. 312/

f. 1953 output was claimed as 123.9 percent of 1952 output. 313/

g. Planned 1954 output was given as 114.76 percent of 1953 output. 314/

areas. The government has announced percentage goals and achievements for the entire nation and also for the Northeast. Although these announced plans and achievements are subject to varying interpretations, the difference in the output of the entire nation and that of the Northeast does represent the output in China proper. Thus, for want of better information, this approach has been used to estimate the output of electricity for the years 1951-53.

The original claims, those made in 1950, 1951, and 1952 for national output, were in the form of percentages of a maximum "preliberation" output, identified as being for most commodities the total of 1936 production in China proper and 1943 in Manchuria. The latest claims in this series were as follows: 1949, 72.3 percent; 1950, 77.5 percent; 1951, 94.5 percent*; and the last claim of this form which has been noted was the 1 January 1953 announcement that preliminary statistics for 1952 showed electric power production to be 114 percent. There has apparently been no subsequent release of plan or performance data in this maximum "preliberation" form. Simultaneously with these claims referred to the preliberation base, there have been announcements of plans and achievements each year as a percentage of the previous year. Results computed from both of these series have shown rather close agreement.

In September 1953 the State Statistical Bureau, which had been established only the previous fall, issued its first public figures 316/ on production of electric power. This release makes no reference to "preliberation" peaks, but contains instead a series of indexes, referred to 1949 as 100, as follows: 1950, 106 percent; 1951, 134 percent; and 1952, 164 percent. As the release was official and the data it contains were 8 months old when issued, it is presumed to be the most accurate statement of the ratio between the outputs for the 4 years in question.

This release contains figures illuminating another confusing aspect of previous claims. In one section it states, "In terms of total value... the Electric Administration fulfilled 96 percent of its plan ... . The percentages of fulfillment of production targets... in factories... under the Ministries during 1952... were as follows:... Electric Power, 99%; Amount of Power sold, 104%... ." In another section it states, "Compared with 1951, output... of

* These year-to-year claims have been summarized in a number of documented intelligence studies. 315/ Percentage figures are rounded.

state-operated and public-private major industries in 1952 showed the following percentages:... Electric power 133 %...;... . Taking the 1949 output as 100, the major production of public and private industries would be as follows:... Electric power 1950, 107; 1951, 134; 1952, 164." (Note that the claimed increase in 1952 over 1951 in the last series is 22.39 percent.) It may be presumed that the difference between the 99-percent plan fulfillment in electric power and 104-percent in electric power sold is explained by smaller losses and less in-plant use of electricity during the year than had been estimated. The 96-percent plan fulfillment by the administration probably includes planned new construction which was not completed during the year, rather than only electric power generation and sale. What appears to be the only plausible explanation of the difference between the claim of a 33-percent increase in generation by electric power stations in which the government had an interest and the claim of only a 22.39-percent increase in total generation of electric power, is to postulate that certain facilities which in 1951 were considered exclusively privately owned were in 1952 transferred to the category in which the government had an interest. Most of the press releases containing plans and claimed increases are not nearly as clear as the foregoing in specifying whether the reference is to value of physical volume, to construction or operation, to amount of power granted, or to amount of power sold. Similarly they do not specify whether the claim refers only to state-operated facilities, to a total including joint industries, or to private plants. For example, Po I-po's State Budget Report in February 1953 gave "a breakdown of industrial production for 1952 as compared with 1951 ... electric power production 29.94% ..." 318/ It appears in retrospect that the claim referred to state-operated facilities, but this was certainly not clear when the official claim was made. Similarly in January 319/ and again in March 1954 320/ a claim of a 23-percent increase in electric power production in 1953 over 1952 has been made without qualification as to what facilities are included. Without further information, it cannot be established whether the total increase in Chinese output was 23 percent or some lesser amount.

It is believed that the most accurate method of interpreting the claims of output in Communist China from 1949 to 1952 is to take the 114 percent of maximum "preliberation" output claimed for 1952 321/ on the presumption that the internal reporting was probably more accurate by that time; to establish the "preliberation" peak figure

by taking the maximum reliable output figures for China proper and Manchuria*; to calculate the 1952 output; to use the State Statistical Bureau Report ratios 322/ to establish the 1949 to 1951 output; and finally to recognize that the resulting output series is properly interpreted as a maximum claim possibly subject to considerable downward revision. This has been done in Table 6.**

The 1953 output of Communist China has been established by taking the 1952 output as derived above, plus the claimed 23.9-percent 323/ increase in 1953 over 1952. Since this is a preliminary claim, it should be recognized as subject to a greater downward revision than the 1949-52 data. (In past years preliminary claims have usually been high.) For comparison purposes, Table 6 also has a figure for the planned 1954 output which was derived from the 1953 output by adding the planned 14.76-percent increase. 324/

With reference to Manchurian output, the first information came from a speech by Kao Kang in March 1950 in which it was announced that the output in Manchuria in 1949 was 1.4 billion kwh and that the plan for 1950 called for 2 billion kwh. 325/ The output for the first half of 1950 was reported as slightly less than 1 billion kwh. 326/ It was subsequently announced that the 1950 plan was overfulfilled. 327/ Output in 1951 and 1952 was claimed as a percentage increase over the previous year. Several despatches early in 1954 agree in giving output of a number of commodities in the Northeast from 1949-52 as a percent of the "preliberation" peak output in the area, reportedly as they were shown on charts at a government exposition late in 1953. 328/ The information on a number of these commodities has checked very well with other information. The series given for electric power was: 1949, 36.7 percent; 1950, 44.6 percent; 1951, 60.0 percent; and 1952, 88.4 percent. Using the reported peak production in Manchuria in 1944 of 4.59 billion kwh,*** the values as calculated in Table 6 check with the 2 billion kwh plan for 1950 reported as overfulfilled, but the 1949 figure is somewhat higher

* See Table 6, footnote d, p. 111, above.

** P. 111, above.

*** The total in 1944 of the output of the Manchuria Electric Company, steam and hydroelectric, the Pen-ch'i Coal and Iron Company, the An-shan Steel Works, and other plants was 4,589,538,000 kwh. 329/ This output was somewhat larger than the 1943 output and has therefore been used in preference to it.

than the reported output of 1.4 billion kwh. This latter discrepancy is believed to be the result of the inaccuracy of the available data when the March 1950 announcement was made. This opinion is reinforced when the March 1950 claim of an increase of 0.6 billion kwh from 1949-50 in the Northeast is compared with the 1953 claim of only a 6 percent increase in 1950 330/ over 1949 for the entire country; 1949 output taken as 72.3 percent 331/ of 7.03 billion kwh* is 5.08 billion kwh, and 6 percent of this would have been 0.3 billion rather than 0.6; it is therefore believed that the originally announced 1.4 billion kwh was subsequently revised upward on a basis of later more complete information. The Northeast output of electric power from 1949-52 as shown in Table 6 was therefore calculated by using the reported 1944 "pre-liberation" peak with the percentage series displayed at the government exposition. The increases in the years 1950-52 check quite closely with the percentages claimed in these years as increases over the preceding year.** It was claimed in February 1953 that the 1953 output was planned to exceed 1952 by 44 percent, 335/ and it was subsequently claimed for all periods of the year to and including November*** that the plan was overfulfilled, without reference to the magnitude of the plan. It was therefore estimated that the 1953 output did exceed that of 1952 by 44 percent. No 1954 plan for the Northeast has yet been announced, but it has been claimed that the January 1954 output exceeded plan. 341/

With reference to the increases in output in 1952 and 1953 a word of caution is in order. The increase in 1952 over 1951 was claimed as 45 percent with 41 percent of the increase resulting from increased utilization of existing facilities, 342/ a single-year increase which, while undoubtedly possible, represents a rather unique achievement.

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* See Table 6, footnote d, p. 111, above.

** Production in 1950 was 20 percent above 1949. 332/ 1951 output was 34.1 percent above 1950: 333/ 1952 output was 45 percent above 1951. 334/

*** In the first half of 1953 in the Northeast, electric power overfulfilled plan, increasing by 52.5 percent over the first half of 1952. 336/ The plan for August was overfulfilled. 337/ In the third quarter, targets for electric power were exceeded. 338/ The target for electric power for October was overfulfilled. 339/ Output of electric power in the Northeast exceeded the plan by 7 percent during November, the third month in succession in which the production target had been overfulfilled. 340/

The claim that in 1953 the increase in output over 1952 was again of the same order of magnitude, 44 percent, 343/ casts some doubt on the credibility of the announced achievements. Output in the first half of 1953 alone was claimed to have exceeded that of the corresponding period of 1952 by 52.5 percent. 344/ Accepting these claims, and evaluating the resulting 1953 output, 5.8 billion kwh, in terms of kilowatt-hours output per kilowatt of installed capacity,* the factor is about 4,300 hours. This is about the level at which the utility industry in the US was operating in 1942.** There is legitimate ground for questioning the ability of the Chinese Communists to operate the economy of the Northeast at a level sufficiently high to result in such an output factor, but, in the absence of information to the contrary, the claims are presented as a best estimate, subject to a considerable margin of error.

The figures given in the body of this report for the electric power output in China proper in 1951, 1952, and 1953 have been taken from Table 6, where they were derived as the difference between the total and the Northeast output. The 1949-50 figures have not been included, since the present government did not establish its control of the area until the end of 1949, and no basis has been located for establishing what output from the China proper area in 1949 and 1950 has been included in the present government's figures.

One additional characteristic of this method of calculating the output of China proper adds to its accuracy. Since the national output has been based on a total of peak production in China proper and Manchuria, of which total the Manchurian peak constitutes over 65 percent, and the Northeast production has been calculated from the same Manchurian peak production, any error in arriving at this Manchurian peak has a lesser effect on the China proper output.

Certain estimates of output in Communist China have been attempted by first estimating the available capacity for the supply of power, and then multiplying it by an estimate of annual use based on "rate-of-utilization" data from Chinese press releases. 347/ These rate-of-utilization figures have been of the following general magnitude: 1949, 22.7 percent 348/; 1950, 28.3 percent 349/; 1951, 35 percent 350/; 1952, 49 percent 351/; and 1953, 53 percent. 352/ It is immediately

* Using an installed capacity in the Northeast of 1.35 million kw. 345/
** Generation per kilowatt of installed (name plate) capacity -- total electric utility industry, year 1942, 4,253 kwh. 346/

evident that the increases in output which would result from the above series of utilization figures (1950, 24 percent; 1951, 24 percent; 1952, 40 percent; and 1953, 8 percent) vary widely from the output increase claims 353/ (1950, 6 percent; 1951, 24 percent; 1952, 24 percent; and 1952, 23 percent). The only way that these estimates might be reconciled is to presume considerable decreases in the available facilities during 1950 and 1952.

So far as is known, there has been no decrease in available equipment during the period in question, but rather increases have been claimed in the amount of equipment available for the period. Since this wide variation does exist between the claimed increase in rate of utilization and claimed total increase in output, it is presumed that the data on rate of utilization refer to only some fraction of the total capacity, possibly that under the direct control of the ministry, rather than to the total facilities, and thus are not applicable to total output estimates.

APPENDIX C

GAPS IN INTELLIGENCE

The absence of any source of complete data since 1936 makes it necessary to consider the conclusions in this report as tentative. The following broad gaps exist in reasonably confirmed information about electric power in China proper:

1. Information on the electric utilities and the power plants in other industrial installations in the area governed by the Japanese-controlled Nanking Government from 1937-45.

2. Information on the power plants operated as parts of other industrial installations, especially the cotton mills in Shanghai, Tsingtao, and Tientsin.

3. Information on the present condition of the equipment in installations taken over by the Chinese Communists.

4. Information on the size of the new plants claimed by the Chinese Communist press to be under construction and recently completed, and information as to whether unreported new plants exist.

5. Information on the number and rating of power generating units manufactured in China and those imported into China since 1950.

6. Information to establish absolute magnitude of current production of electric energy in the area. The absolute magnitude of the "pre-liberation" base used in reporting present achievements would be one approach. Information on the kilowatt-hours output per installed kilowatt of capacity would constitute a second approach. Information on consumption by major segments of the economy is another approach to this problem.

7. Information on localized power requirements of other industries. Because there is almost no interconnection between localities in China proper and electricity must be used where it is generated, and because most other intelligence research on China proper has not been refined sufficiently to establish localized power requirements, it has been impossible to establish a reasonably exact consumption pattern.

8. Information on costs and income of the electric power industry. Only very fragmentary information on the costs of producing electricity, and the prices charged for it, has thus far been located. It has not permitted the inclusion in this report of any discussion of the contribution of the electric power industry to the National budget or to the Gross National Product.

APPENDIX D

SOURCES AND EVALUATION OF SOURCES

1. Evaluation of Sources.

In preparing this report, the following sources were most helpful. Strategic Engineering Study No. 144, Electric Power of China (in two volumes), prepared by Engineer Research Office, North Atlantic Division, Corps of Engineers, Strategic Intelligence Branch, Military Intelligence Division, Office Chief of Engineers, US Army, November 1944, published by Army Map Service, Washington, D.C., 1945.

This report consists of three sections: general information, specific information on power stations, and supplemental statistical data. The most valuable section of this report is the information on individual power stations. An exhaustive list is given, including available photographs and sketches, and each plant has been carefully located on a 1:2,000,000 scale map, one map for each province of China.

The preface to this report indicates that the information was obtained largely from a search through libraries in New York City, and that the greater part of the information was published before 1939. It is unfortunate that, in an effort to include all available information, the same plant has in many cases been listed several times in the report, usually giving a different date of information or a slightly different description of the equipment involved in each case. Use of this report for purposes of estimating power available in a given area, therefore, calls for very careful evaluation in order to eliminate this duplication. This report was used as the primary source of the plant list included in Appendix A.

Preliminary Data on Electric Power Supply in China, prepared by the Bureau of Electrical Engineering, Federal Power Commission, November 1944. Confidential.

The information in this report is said to have come from members of the staff of the Foreign Economic Administration, with technical assistance from the Federal Power Commission staff. Also cited are Chinese Nationalist government reports and reports of certain US engineering companies.

Of particular interest in this report are the data cited as being taken from the Statistical Review for the Year 1936 of the National Construction Commission of the Chinese Government. It was impossible to locate the original of this statistical review during the preparation of the current report. So far as is known, this statistical study was the last complete official study of electric power in the area known as China proper.

The Federal Power Commission study contains a list of plants in major cities, along with the population of each city, and a set of 2 maps, drafted in October 1944 at a scale of about 1 to 4 million, on which the plants are located.

Air, China Project. Unclassified.

The Air Force Office of Intelligence has an activity known as the China Project for the exploitation of published materials on the industries of China. [redacted] 25X1A2g

In general this project has exploited books, magazines, and newspapers, both those published by the Nationalist government when it was on the mainland of China and those currently available from Communist sources. The card format of the publication is convenient to use, and this source has proved particularly valuable for information on conditions during the period of Nationalist control in China proper from 1945-49.

News Release Sources.

STATSPEC [redacted]

Far East Weekly Economic Abstracts. Confidential.

These two publications contain most of the economic information from the Chinese Communist New China News Agency (NCNA) releases, both those in English and those to the Home Service.

State, American Consul General, Hong Kong, Survey of the China Mainland Press (daily); Survey of the Hong Kong Chinese Press (daily); and Current Background (occasional issues). Unclassified.

These publications contain somewhat more complete translations of the economic information in the NCNA releases; however, they apparently do not always receive all of the information picked up by

STATSPEC [redacted] especially that noted as Home Service.

Collectively, the above sources have proved to furnish a major part of the information on Chinese Communist activity. Although almost all of this information is in ambiguous form, it is the only reasonably plentiful source of current information.

25X1A [redacted]

This 55-page despatch is a collection of the historical information on electric power in China coupled with a quite complete exploitation of information from press releases during the Chinese Communist regime.

Although the historical information and the collection of assorted Communist claims compiled here are quite valuable, it is believed that the conclusions on available capacity and output are erroneous. It is believed that in the preparation of this despatch undue weight has been given to the data released by the Nationalists during the 1946-48 period when they were in control of only a varying fraction of the area. This has lent an extreme downward bias to the conclusions.

2. Sources.

Evaluations, following the classification entry and designated "Eval.," have the following significance:

Source of Information	Information
Doc. - Documentary	1 - Confirmed by other sources
A - Completely reliable	2 - Probably true
B - Usually reliable	3 - Possibly true
C - Fairly reliable	4 - Doubtful
D - Not usually reliable	5 - Probably false
E - Not reliable	6 - Cannot be judged
F - Cannot be judged	

"Documentary" refers to original documents of foreign governments and organizations; copies or translations of such documents by a staff officer; or information extracted from such documents by a staff officer, all of which may carry the field evaluation "Documentary."

Evaluations not otherwise designated are those appearing on the cited document; those designated "RR" are by the author of this report. No "RR" evaluation is given when the author agrees with the evaluation on the cited document.

Both primary and secondary sources are given.

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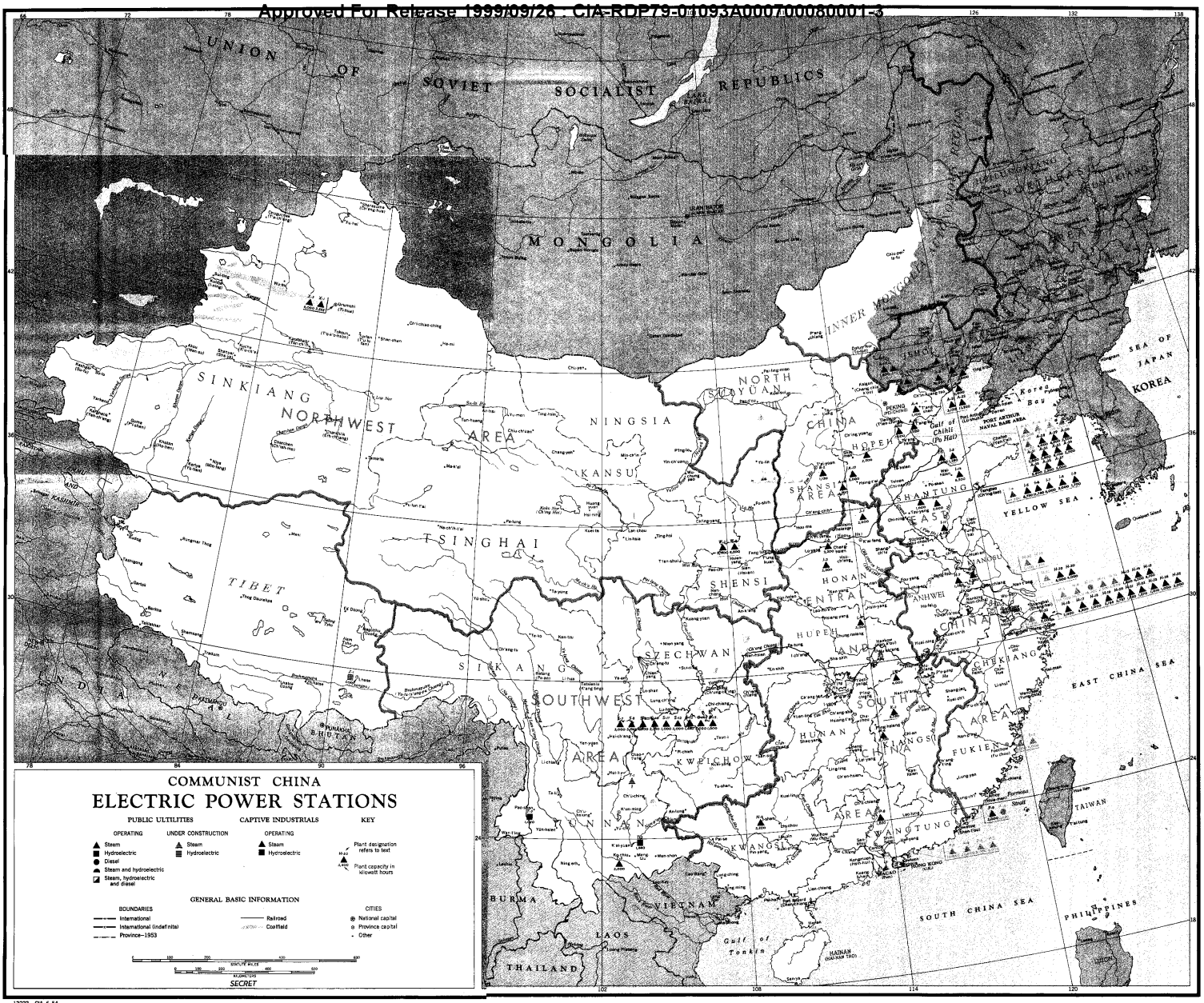

COMMUNIST CHINA

ELECTRIC POWER STATIONS

PUBLIC ULTILITIES — CAPTIVE INDUSTRIALS — KEY

OPERATING	UNDER CONSTRUCTION	OPERATING
▲ Steam	▲ Steam	▲ Steam
■ Hydroelectric	▤ Hydroelectric	■ Hydroelectric
● Diesel		
▲ Steam and hydroelectric		
◪ Steam, hydroelectric and diesel		

H-20 — Plant designation refers to text

A-200 — Plant capacity in kilowatt hours

GENERAL BASIC INFORMATION

BOUNDARIES
- International
- International (indefinite)
- Province—1953
- Railroad
- Coalfield

CITIES
- ⊗ National capital
- ⊙ Province capital
- · Other

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